PB88-172127

Superfund Record of Decision (EPA Region 2) Diamond Shamrock Site, Newark, New Jersey (Remedial Alternative Selection), September 1987

(U.S.) Environmental Protection Agency
Washington, DC

20 Sep 87

U.S. Department of Commerce
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United States
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Office of
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EPA/ROD/R02-87/053
September 1987

EPA

Superfund Record of Decision:

Diamond Shamrock, NJ

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Contents: Background chronology; Scope of this record of decision; Site location and description; Remedial investigation findings; Risks presented by the site; The criteria for remedy selection; Description and evaluation of remedial alternatives; Cleanup standards; Description of the selected alternative; Enforcement; Community relations; Glossary of terms and acronyms.

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RECORD OF DECISION
Remedial Alternative Selection

RECORD OF DECISION DECLARATION

Site: Diamond Shamrock Superfund Site
Remedial Alternative Selection for the Properties
Located at 80 and 120 Lister Avenue, City of Newark,
Essex County, New Jersey

Documents Reviewed or Relied Upon

I am basing my decision concerning the appropriate remedial alternative for the Diamond Shamrock Superfund Site (also known as the Diamond Alkali Superfund Site) primarily on the following documents:

1. 80 Lister Avenue Site Evaluation Report* (3 Volumes), February 1985;
2. 120 Lister Avenue Site Evaluation Report* (2 Volumes), May 1985;
3. 80 and 120 Lister Avenue Site Evaluation Report Addendum* (1 Volume), February 1986;
4. 80 Lister Avenue Quality Assurance Data Review (By NUS Corporation under contract to the New Jersey Department of Environmental Protection (NJDEP);
5. 80 Lister Avenue Feasibility Study*, October 1985;
6. 80 Lister Avenue Feasibility Study - Response to NJDEP Comments*, June 1986;
7. 80 Lister Avenue Feasibility Study - Response to EPA Comments*, June 1986;
8. Proposed Interim Remedial Action Plan - Diamond Shamrock Superfund Site, EPA - Region II, July 1987;
9. Public comments;
10. Responsiveness Summary.

A substantial number of additional documents are also included as part of the administrative record, which serves as the basis of this Record of Decision (ROD).

* Documents prepared by contractors for Diamond Shamrock Chemicals Company.

My decision is also based on a number of additional documents which are published and generally available. These documents include the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. Sections 9601 et seq., as amended by the Superfund Amendments and Reauthorization Act of 1986; the National Oil and Hazardous Substances Pollution Contingency Plan, 40 C.F.R. Part 300, and other documents cited elsewhere in this ROD.

Description of the Selected Remedial Alternative

The components of the selected remedial alternative are described below:

1. Construct a slurry wall encircling the site tying into the silt layer underlying the site.

2. Construct a flood wall and appurtenances to protect the site from the 100 year flood. Such flood wall shall conform to the specifications and guidances of the U.S. Army Corps of Engineers and the NJDEP and shall include as a design consideration the impact of the proposed Passaic River flood control project.

3. Disassemble and decontaminate all non-porous permanent structures and materials to the maximum extent practicable for off-site reuse, recycling or disposal.

4. Transport all drums containing hazardous substances but containing less than 1 ppb of TCDD off-site for treatment or disposal.

5. Demolish all remaining structures on-site and secure all materials contaminated above 1 ppb of TCDD on-site. Secured materials shall be segregated to the maximum extent practicable to afford access to and facilitate removal of the more highly contaminated materials, should such removal be selected as a remedy at a later date.

6. Stabilize and immobilize the contents of the remaining drums of dioxin contaminated materials.

7. Locate and plug inactive underground conduits and reroute active systems.

8. Haul, empty, spread and compact the contaminated materials presently stored at 120 Lister Avenue; decontaminate the shipping containers for off-site reuse, recycling or disposal.

9. Install, operate, and maintain a ground water withdrawal system designed to maintain a hydraulic gradient preventing the migration of ground water from the volume contained within the slurry wall.

10. Install, operate, and maintain a treatment system for ground water and other aqueous liquids.

11. Construct a surficial cap consisting of suitable materials designed to meet the requirements of the Resource Conservation and Recovery Act.

12. Implement suitable monitoring, contingency, operation and maintenance, and site security plans to ensure the protection of human health and the environment during and after the installation of the selected alternative.

13. On-site placement and capping of all sludge generated from the wastewater treatment processes until such time that an alternative method of sludge management is approved.

14. Design, construct and operate the remedy to attain the cleanup standards listed in Tables III, V, VII of Section VIII of this Record of Decision.

15. Perform a Feasibility Study every 24 months following the installation of the selected interim remedy to develop, screen and assess remedial alternatives and to assess the performance of the selected remedy.

Consistent with Section 121(c) of CERCLA, which requires the periodic reevaluation of containment remedies, the proposed plan calls for the reevaluation of the remedy every two years. In view of the periodic reevaluation process, EPA and NJDEP consider the selected remedial alternative to be an interim remedy.

Declaration

Consistent with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Part 300, I have determined that the remedial alternative selected for the Diamond Shamrock Superfund Site is cost-effective, and provides adequate protection of public health and welfare and the environment.

I have also determined that the action being taken is consistent with Section 121 of SARA and is appropriate when balanced against the availability of Trust Fund monies for use at other sites.

The State of New Jersey, Department of Environmental Protection has been consulted and concurs with the selected remedial alternative.

SEPTEMBER 30, 1987
Date

Christopher J Daggett
Regional Administrator

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RECORD OF DECISION SUMMARY

I. Background Chronology Leading to this Record of Decision

The following chronology summarizes events leading to this Record of Decision:

3/51 - The Diamond Alkali Company (subsequently known as the Diamond Shamrock Chemicals Company) purchased an existing chemicals manufacturing facility at 80 Lister Avenue, Newark, NJ. The company operated the facility from 1951 to 1969 manufacturing 2,4,5-trichlorophenol; 2,4,5-T; 2,4-D; and other chemicals and pesticides. From 1969 until 1977 when manufacturing activities were halted, the facility was operated by other companies.

5/83 - As a result of EPA's National Dioxin Strategy, which targeted facilities which produced 2,4,5-trichlorophenol and/or its pesticide derivatives for sampling, the site was sampled for dioxin (i.e., 2,3,7,8-tetrachlorodibenzo-p-dioxin) and dioxin was found in the samples. Subsequently dioxin and other hazardous substances were also found at other properties in the area and in biota and sediment samples from the Passaic River, which borders the site. To address the off-site contamination, EPA, under the removal authority of CERCLA, and the NJDEP initiated a number of clean-up activities which included the vacuuming of contaminated streets and the excavation of contaminated soil.

9/83 - The site was proposed for the Superfund National Priorities List.

3/84 - The NJDEP issued an Administrative Consent Order (ACO I) which required Diamond Shamrock to perform a Site Evaluation and Feasibility Study for 80 Lister Avenue as well as other response actions for the 80 Lister Avenue property.

9/84 - The site was added to the National Priorities List.

12/84 - The NJDEP issued a second Administrative Consent Order (ACO II) to Diamond Shamrock requiring Diamond Shamrock to complete the aforementioned cleanup actions which had been initiated by EPA, under CERCLA removal authority, and NJDEP for the off-site properties. This Order also required Diamond Shamrock to perform a Site Evaluation for 120 Lister Avenue and expanded the scope of the Feasibility Study to include the hazardous substances stored at 120 Lister Avenue. This Feasibility Study addresses the 120 and 80 Lister Avenue sites as a source control operable unit. Additional areas of concern include off-site studies of the Passaic River and bedrock aquifer. These will result in additional operable units at some time in the future.

1/85 - EPA and Diamond Shamrock signed a voluntary cost reimbursement agreement which resulted in the recovery of nearly 2 million dollars which EPA had spent for the site.

2/85 - Diamond Shamrock submitted a three volume Site Evaluation Report for 80 Lister Avenue. (Using Superfund terminology, this would be a Remedial Investigation Report). The report quantified the extent of hazardous substance contamination in soils, wastes, ground water, and structures at the site.

5/85 - Diamond Shamrock submitted a two volume Site Evaluation Report for 120 Lister Avenue, which is adjacent to the former Diamond Alkali plant and is currently used to store the dioxin wastes resulting from the off-site removal actions.

10/85 - NJDEP released a report entitled "A Study of Dioxin in Aquatic Animals and Sediments" which presented data showing dioxin contamination of fish and crustaceans collected in the vicinity of the site.

12/85 - Diamond Shamrock submitted the Feasibility Study (FS) for 80 120 Lister Avenue.

2/86 - Diamond Shamrock Submitted an addendum to the Site Evaluation Reports addressing NJDEP comments.

2/86 - A Public Meeting on FS was held on 2/86.

3/86 - Diamond Shamrock submitted a two volume report entitled "Passaic River Sediment Study", which further defined the extent of the dioxin contamination of the Passaic River sediments.

4/86 - NJDEP and EPA comments on the Feasibility Study were transmitted to Diamond Shamrock.

6/86 - Diamond Shamrock responded to the NJDEP and EPA comments on the Feasibility Study.

7/87 - The Proposed Interim Remedial Action Plan (PIRAP) explaining the Remedial Alternative preferred by NJDEP and EPA was made public.

8/87 - A Public Meeting on the PIRAP was held.

II. Scope of this Record of Decision

As indicated in the .background chronology provided above, the Site Evaluations and Feasibility Study, which are a chief basis for this Record of Decision, are for the properties at 80 and 120 Lister Avenue. Other properties that were contaminated by releases of hazardous substances from the 80 Lister Avenue property are not addressed by the Feasibility Study or by this Record of Decision. The cleanup of these other properties is being addressed separately from this Record of Decision, as outlined in the background chronology above (12/84) and will be addressed as subsequent operable units.

In addition, the existing contamination of the Passaic River is being addressed by a separate study. The cleanup of the River sediments is not addressed in this Record of Decision. While the remedy selected by this

Record of Decision will have a beneficial effect on the Passaic River, ground water and other properties by abating releases from 80 and 120 Lister Avenue, it is not intended to clean up the existing contamination of the River or other properties. Other actions have been and will be taken by EPA and NJDEP to address off-site problems resulting from hazardous substances released from 80 Lister Avenue.

Thus, this Record of Decision has a limited scope and is not intended to address all contamination related to the site. Section 300.68(c) of the NCP specifically authorizes a response action to be conducted in discrete parts (referred to as operable units), each having a limited scope.

III. Site Location and Description

The 80 Lister Avenue property is located in the Ironbound section of Newark, New Jersey. The property occupies approximately 3.4 acres on the north side of Lister Avenue. It is nearly rectangular in shape, extending about 375 feet in an east-west direction and 405 feet north-south. The property is bounded on the north by the Passaic River, on the east by the former Sergeant Chemical Company (120 Lister Avenue) site subsequently purchased by Diamond Shamrock, at the southeast corner by the Duralac Company property, and on the south and west by Sherwin-Williams Company property. Vehicular access to the property is via a common right-of-way shared with Duralac entering the southeast corner of the property. The property is formally described as Lots 58 and 59 in Block 2438 on the Newark tax maps .

The location of the site within Newark and the Ironbound section is shown on the accompanying maps (Figures 1 thru 3).

Geology

The site is situated in the Piedmont Lowland section of the Piedmont Physiographic Province. This province is located between the Atlantic Coastal Plain and the Valley and Ridge Province.

In New Jersey, the Piedmont Lowland section is underlain by igneous and sedimentary rocks of Triassic-Jurassic Age. The igneous rocks in the section are generally more resistant and form hills and ridges while the sedimentary rocks occur in the low areas. The section is characterized by rounded ridges separated by wide valleys and isolated hills which rise abruptly above the surrounding landscape. The general surface of the section slopes from around Elevation 400 feet mean sea level (MSL) in the northwest to sea level at Newark Bay.

As an industrial area that has been occupied for over 100 years, the entire site has been built up with fill. Approximately 6 to 8 feet of cinders, bricks, sand, and rubble have been placed over natural materials. In this process, the site has been intentionally leveled. Total relief across the site is approximately 3 feet with the lowest point along the railroad tracks at the southern boundary. Elevations vary between approximately 7 and 10 feet MSL. Much of the site has been covered with either pavement or gravel.

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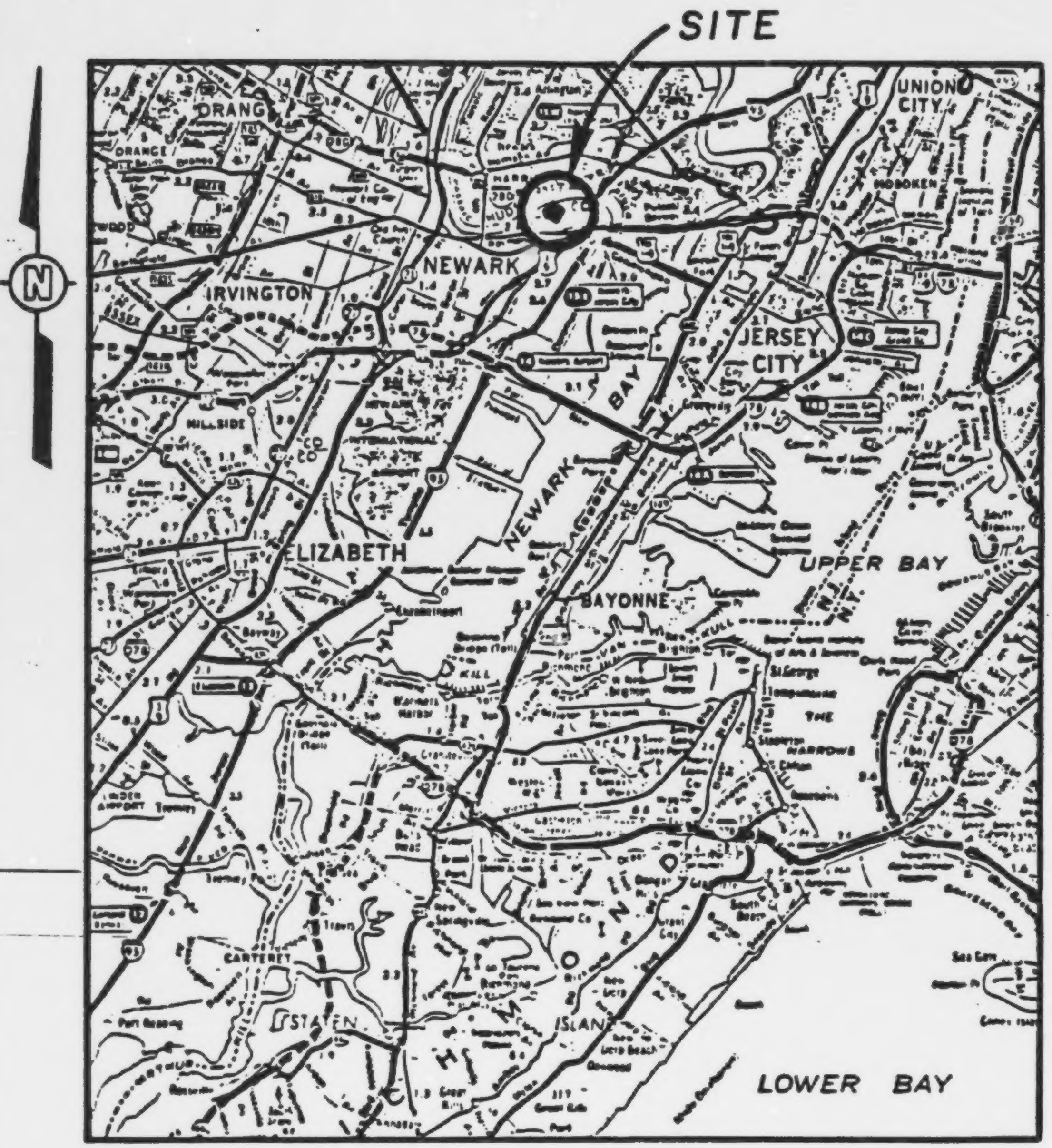
SITE
N
ORANGE
UNION CITY
HOBOKEN
NEWARK
IRVINGTON
HILLSIDE
JERSEY CITY
NEWARK BAY
ELIZABETH
BAYONNE
UPPER BAY
THE NARROWS
STATEN ISLAND
LOWER BAY

ROAD CLASSIFICATION:

- HEAVY DUTY
- MEDIUM DUTY
- LIGHT DUTY

SCALE 0 2 4 MILES

INTERSTATE

STATE ROUTE

U.S. ROUTE

FIGURE 1

SITE LOCATION MAP
80 LISTER AVENUE

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

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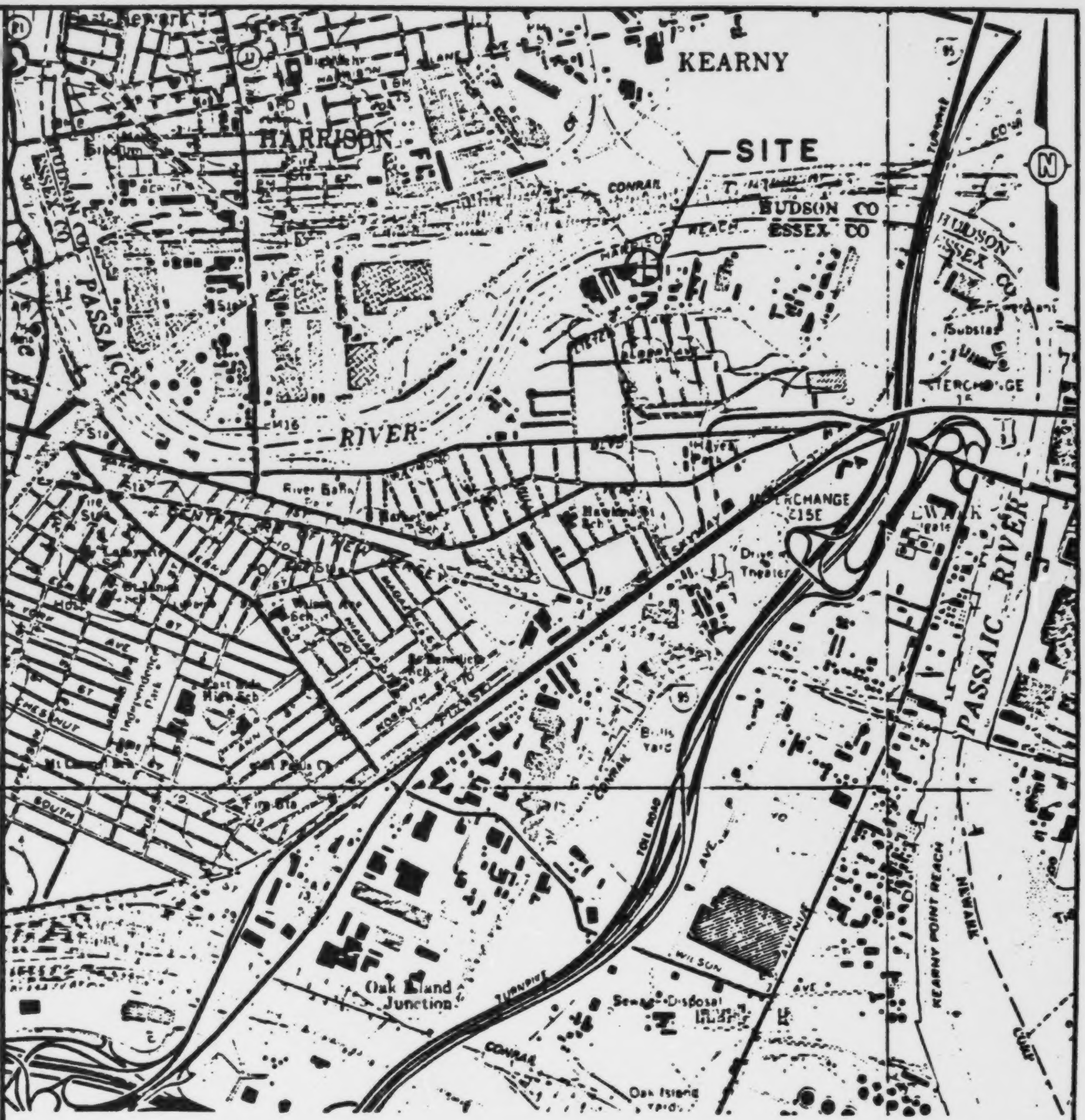
KEARNY
HARRISON
SITE
CONRAIL
HUDSON CO
ESSEX CO
PASSAIC
RIVER
N
INTERCHANGE 15E
Drive-in Theater
Oak Island Junction
Sewage Disposal
Oak Island Yard
WILSON
AVE
TURNPIKE
KEARNY POINT REACH
PASSAIC
RIVER

FIGURE 2

Reproduced from best available copy.

SITE VICINITY MAP
80 LISTER AVENUE

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

SCALE
0 2000 4000 FEET

REFERENCE:
7.5 MINUTE USGS TOPOGRAPHIC QUADRANGLE MAPS OF: ELIZABETH AND JERSEY CITY, N.J.-N.Y. DATED: 1967, PHOTOREVISED: 1981, SCALE: 1" = 2000'.

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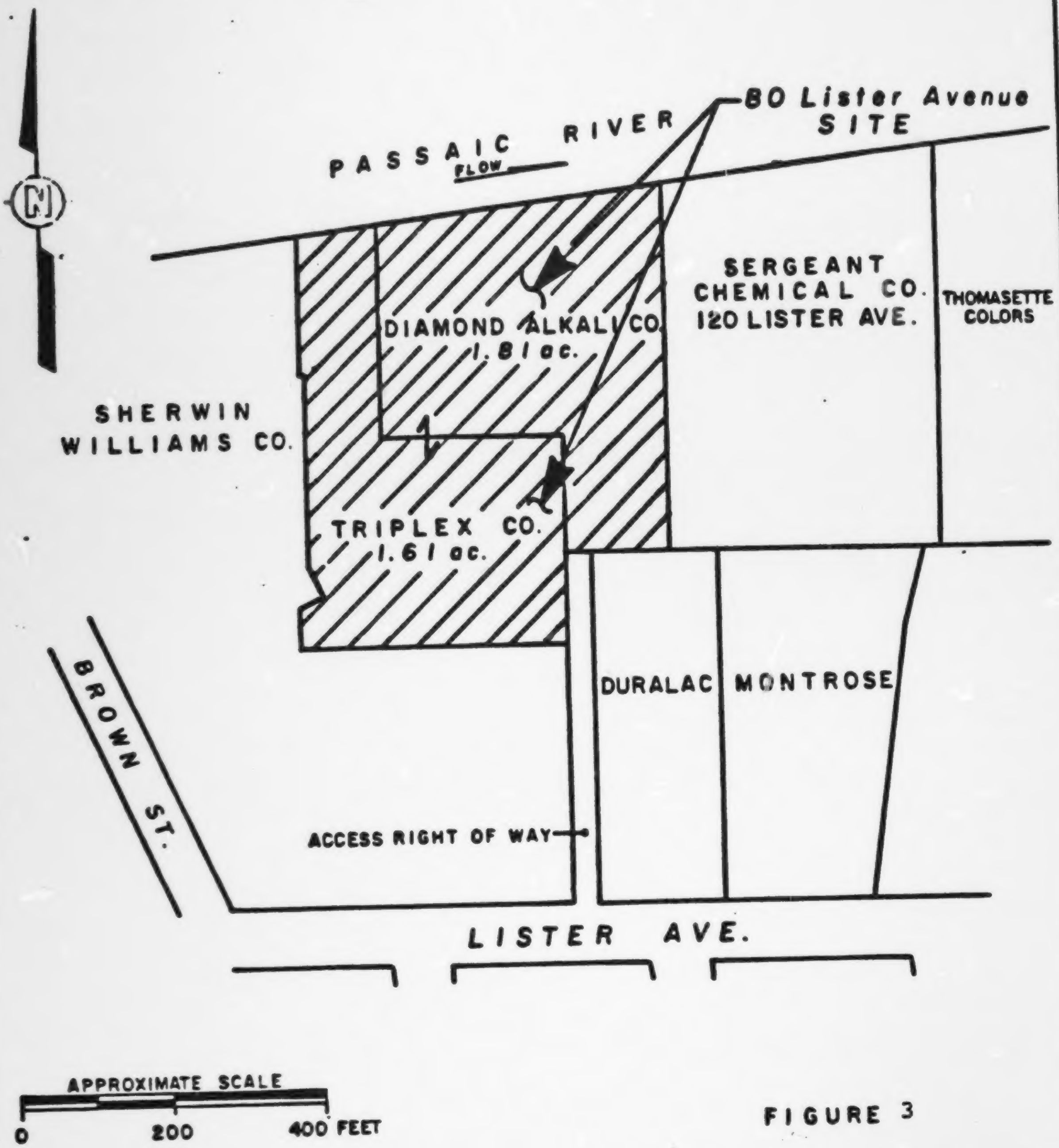
N
80 Lister Avenue
SITE
PASSAIC RIVER
FLOW
DIAMOND ALKALI CO.
1.81 ac.
TRIPLEX CO.
1.61 ac.
SERGEANT
CHEMICAL CO.
120 LISTER AVE.
THOMASETTE
COLORS
SHERWIN
WILLIAMS CO.
BROWN ST.
DURALAC
MONTROSE
ACCESS RIGHT OF WAY
LISTER AVE.
APPROXIMATE SCALE
0
200
400 FEET

DRAWN BY	J.LOBRECO 6-13-84	CHECKED BY APPROVED BY	JTP DP	2-13-85 10-30-85	DRAWING NUMBER	846248-A5

REFERENCE:
DIAMOND ALKALI COMPANY
DWG. NO. 2NS-583-
TITLED: REAL ESTATE PROPERTY

FIGURE 3

PLAT PLAN FOR 80 LISTER AVE.
AND ADJACENT PROPERTIES

PREPARED FOR

DIAMOND SHAMROCK
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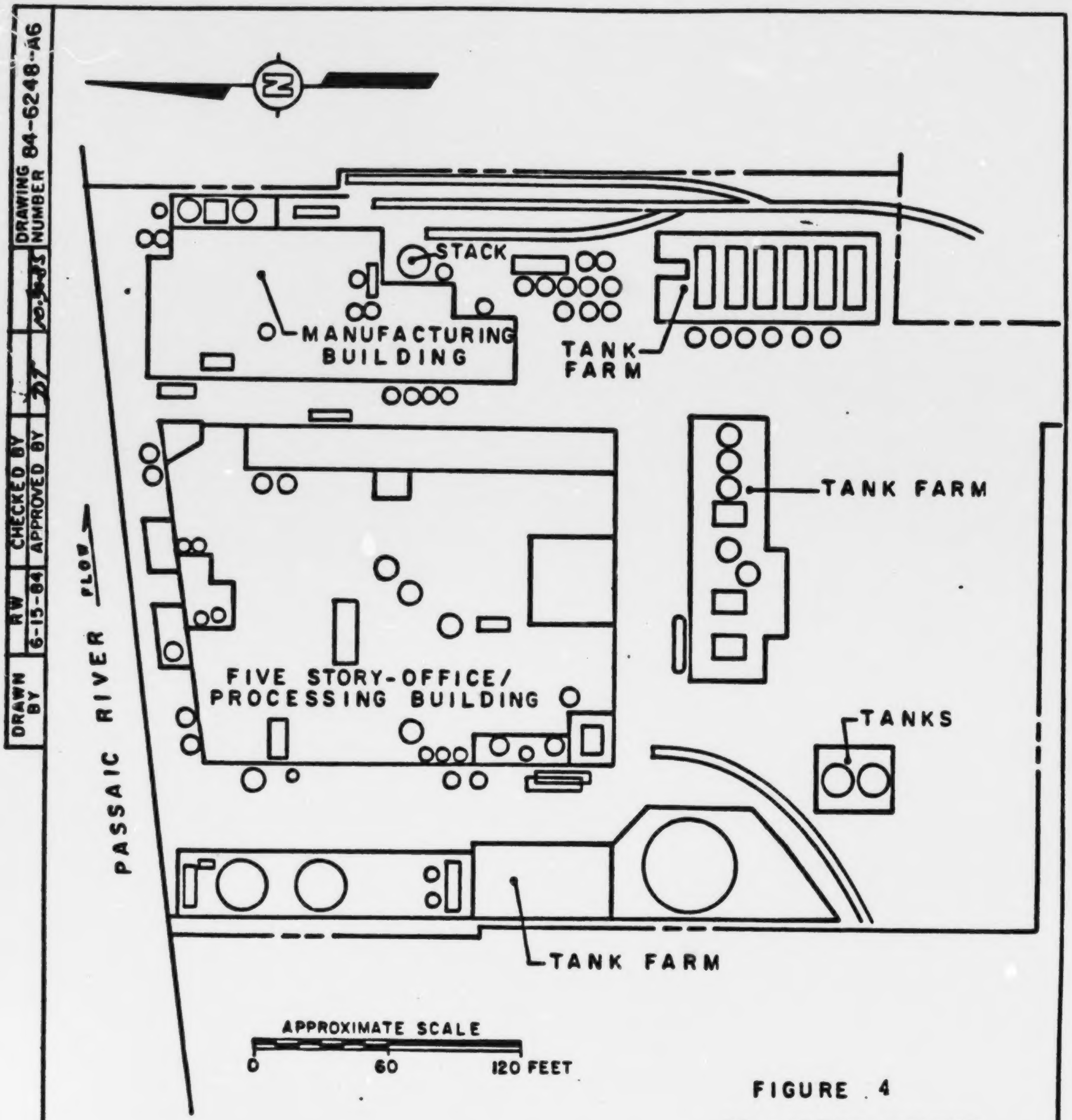
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N
STACK
MANUFACTURING BUILDING
TANK FARM
TANK FARM
FIVE STORY-OFFICE/ PROCESSING BUILDING
TANKS
PASSAIC RIVER
FLOW
TANK FARM
APPROXIMATE SCALE
0
60
120 FEET

FIGURE 4

80 LISTER AVENUE
FACILITY LAYOUT
PRIOR TO EXPLOSION
FEBRUARY, 1960

PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

LEGEND

— — — — 80 LISTER AVENUE PROPERTY BOUNDARY

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Surface Water

The site is located in the Lower Valley portion of the Passaic River drainage basin. The Lower Valley is the southeasterly portion of the basin lying between the Central Basin and the mouth of Newark Bay. It is characterized as a flat relatively narrow floodplain of 1,000 to 2,000 feet in width, abutting low rolling hills. From Dundee Dam to the mouth of Newark Bay, the river is a tidal estuary and is navigable. The site is approximately three miles upstream from the mouth of Newark Bay.

The closest known surface water gaging station on the Passaic River is at Little Falls, New Jersey, which is approximately twenty-six river miles upstream from the site. The gaging station is also upstream from the Dundee Dam, and therefore, river elevations at this station are much higher than river elevations at the site, and thus are not representative of site conditions. Tidal elevations for the Passaic River at Newark are reported by the National Oceanic and Atmospheric Administration (NOAA, 1972). The mean tidal range (difference in height between mean high water and mean lower water) is reported by NOAA as 5.1 feet. The spring range (average semidiurnal) range occurring semimonthly as a result of the moon being New or Full is reported by NOAA as 6.1 feet with the mean tide level (midway between mean low water and mean high water) at 2.5 feet.

The Passaic River basin lies in the tracks of most east coast storms and is consequently subject to occasional rainfalls of great intensity. The types of storms producing damaging floods on the Passaic include late summer storms originating over the ocean to the south (such as 1881, 1903, 1945); fall or hurricane storms (such as 1810, 1919, 1938, and 1955); spring storms originating over the continent to the west and southwest (such as 1819, 1843, 1865). Of these storms, the greatest flood of record was due to the storm of 1903 which, in the reach from Dundee Dam to the Newark Bay, inundated an area of 1,520 acres to a maximum depth of 14.5 feet. The most recent severe floods occurred in 1936, 1945, 1955, and 1968.

Unlike upstream areas where flooding is controlled by rainfall events, flooding of the Passaic River at the site is controlled mainly by tidal influences. The greatest potential for inundation in the Lower Valley comes from the storm surge and tidal flooding associated with a major storm. The cross-sectional area of the channel in the tidal zone of the river is so great in relation to the discharge that any rise in water level as a result of rainfall is minimal when compared to elevation changes due to tides. According to the U.S. Army Corps of Engineers flood insurance study for the region, flood elevations for the 10-, 50-, 100-, and 500-year tides are 7.5, 9.3, 10.2, and 12.8 feet above MSL, respectively. Partial inundation of the site from the Passaic River was reported in 1983.

Flooding occurs in the Lower Valley (and at the site) due to a relatively narrow flood channel that is constricted by many bridges, heavy urban development along the river banks, and generally flat slopes that are constrained by rock outcrops. The natural storage in the Central Basin reduces the contributing flood flows into the Lower Valley from the flash-flood susceptible highland tributaries (the Ramapo, Wanaque, Pequannock, Rockaway, and Whippany Rivers).

Ground Water

The source of ground water recharge at the site is precipitation that does not run off the land surface to streams or return to the atmosphere through evapotranspiration. This precipitation infiltrates the ground and moves through and is stored in geologic formations. The regional aquifers in the vicinity of the site are the bedrock of the Brunswick Formation of Triassic age and the unconsolidated glacio-fluvial sands and gravel deposits of Pleistocene age.

The principal source of ground water in the area is the rock of the Brunswick Formation. The shales and sandstones are generally capable of sustaining moderate to large yield wells, but the Orange Mountain Basalt is capable of only small to moderate yields. The unconsolidated Pleistocene sand and gravel deposits, although capable of sustaining large yields, are of somewhat limited extent in the vicinity of the site.

Water in the rock of the Brunswick Formation occurs under both unconfined and confined conditions. In the upland areas, the aquifer is generally unconfined. In the lowlands of the Hackensack Meadows, the aquifer is generally confined or semiconfined by glacio-lacustrine clay. Where the aquifer is confined by relatively impermeable layers, it is commonly under artesian pressure. The area around Newark has been subjected to heavy pumping, however, and the artesian pressure has been reduced. In part of Newark, extensive pumping has actually dewatered parts of the aquifer such that it no longer behaves as a confined aquifer.

Ground water moves in the bedrock both vertically and horizontally from zones of secondary porosity through systems of interconnected joints and fractures. Most wells that are screened in this interval draw from more than one water-bearing zone, but the boundaries of the zones have not been accurately defined. Some wells penetrate from 400 to 600 feet below ground surface to reach these zones. The best producing wells, however are 300 to 400 feet deep.

The glacio-fluvial sands and gravels constitute an aquifer of limited extent. In the site area, these materials occur as valley fill deposits occupying buried bedrock valleys. The sands and gravels are generally interlayered with till and clays which reduce their total permeability. However, where layers of coarse sand and gravel are encountered, wells yielding 175 to 600 gallons per minute (gpm) have been developed. Unfortunately, pumping from this aquifer has also been in excess of fresh water recharge and, as a result, salt water intrusion has been known to occur.

Ground water yields from the Brunswick Formation range from 35 to 820 gpm for the shales and sandstones and from 7 to 400 gpm for the Orange Mountain Basalt. Specific capacities of the wells in the shales and sandstones ranged from 0.2 to 70 gpm per foot of drawdown (averaging 11.1 gpm per foot of drawdown). Specific capacities of wells in the basalt range from 0.05 to 5.66 gpm per foot of drawdown (averaging 1.74 gpm per foot of drawdown).

Although the water quality of the bedrock aquifer is generally considered to be good, salt water intrusion in the vicinity of the site has occurred as a result of the heavy pumping in this industrialized area. In 1879, analysis of a ground water sample from this vicinity showed 6.2 ppm chloride. In 1948, a ground water sample showed 1900 ppm chloride.

The heavy pumping has greatly lowered water levels in the area over the last

100 years. In eastern Newark adjacent to Newark Bay and the Passaic River, the water levels by the year 1900 had been pumped from 40 to 130 feet below ground surface. Continued pumping in the 1900's has lowered the water level even further. In 1879, evaluation of wells in the vicinity showed ground water levels from a few feet above to 25 feet below the ground surface. The heavy pumping has reversed the natural gradients in this vicinity and the dredging of the shipping channels in Newark Bay and the Passaic River has exacerbated the salt water intrusion problem by removing part of the barrier between the ground and surface waters.

Site History

Industrial development on the site is reported to date from the 1870's. Drawings from 1914, revised in 1922, show the site to be part of the Lister Agricultural Chemical Company property which extended for some distance along the Passaic River. This plant site also included most of the other nearby industrial sites.

It was during the period of ownership by Lister that the site reached its present dimensions following filling along the south shore of the Passaic River to form the northernmost 30 percent of the property. Much of the remainder of the site is also filled with the granular material reportedly used to fill the marsh land that existed in the natural state. Several buildings were on the site including the Lister power plant, which remains today as the chemical manufacturing building.

When Lister Agricultural Chemical Company ceased operations the property was subdivided largely along the lines that form the present property boundaries and was sold. A 1.8-acre parcel (the northeast portion of the present site) was eventually acquired by the Kolker Chemical Works, Inc., which, by the mid-1940's, was operating an agricultural chemicals plant on the site. This was the beginning of the manufacturing operations that are related to the current conditions at the site.

Kolker was an early producer of both dichlorodiphenyl trichloroethane (DDT) and the phenoxy herbicides. The exact dates when manufacture started is not known, but it is believed that DDT production was underway before the end of World War II and that herbicide production started by 1948. In addition to DDT and the phenoxy herbicides, other products of interest produced on the site included hexachlorobenzene (HCB), ovex (a miticide), Lindane and low gamma-benzene hexachloride (low gamma-BHC). Several derivatives of benzene sulfonyl chloride and sulfonates were also made, but these were all low volume products. In all cases, manufacture started with readily available raw materials and the principal intermediates were made on the site.

The principal products made on the site by Kolker were DDT and the phenoxy herbicides. Ownership by Kolker ceased in March 1951 when the Kolker Chemical Works was acquired by Diamond Alkali Company (Diamond Shamrock Chemicals Company).

During this period the manufacture of several products was either transferred to other locations or discontinued, leaving the phenoxy herbicides as the only products of the plant. A major impetus for this change was an explosion in February 1960 which destroyed several plant processes. When rebuilt the plant only included processes for the manufacture of the phenoxy herbicides and their intermediates.

Modernization and expansion continued during the 1960's, more than doubling total phenoxy capacity, to 15 million pounds per year.

The changes started in 1955 with the transfer of Lindane manufacture to another location. Production of low gamma-BHC continued until 1957 or 1958 when it also was relocated. The biggest change, however, was the transfer of DDT production, which was moved to Texas in late 1958 or early 1959. During the late 1950's several process changes were instituted to improve the operating efficiency of the plant. Among these was a change instituted around 1956 to the trichlorophenol (TCP) process effluent with the installation of an industrial sewer connecting to the Passaic Valley Sewerage Commission (PVSC) Lister Avenue line. Following installation of that connection, most of the plant process wastes were discharged through the PVSC treatment plant.

An explosion in the TCP unit during February 1960 destroyed the large five-story building in which it and several other plant processes had been located. Following the explosion, a decision was made to limit future production to the phenoxy herbicides, ending output of HCB, ovex and the benzene sulfonyl chloride derivatives.

A larger site was required for rebuilding the plant on the scale desired, so an adjacent 1.6-acre parcel (consisting of the southwest portion of the present site) was leased from the Triplex Oil and Refining Company (later Walter Ray Holding Company). This site, which had been used for reclaiming oil, contained several buildings and large tanks which were razed to permit installation of a new laboratory and office building, a maintenance shop/warehouse building, and a tank farm for flammable raw materials along the west side of the property.

Following demolition of the remains of the damaged building, a new process building devoted to the manufacture of sodium trichlorophenol (NaTCP), 2,4-dichlorophenol (2,4-DCP), monochloroacetic acid (MCA), and by-product hydrochloric acid (HCl) was erected along the river near what had been the north end of the old building. Following this construction, the manufacture of the intermediates was carried out in the new buildings, leaving the old but undamaged chemical manufacturing building for the production of 2,4-dichlorophenoxyacetic acid (2,4-D), 2,4,5,-trichlorophenoxyacetic acid (2,4,5-T), and their esters and amines.

The process building remains largely unchanged to this day. The only addition was equipment installed in 1967 to purify the NaTCP by removing dioxin. The period 1963 to 1967 saw several major projects in the 2,4-D and 2,4,5-T manufacturing areas which were designed to improve working conditions, improve product quality, and expand capacity. Most significant among these changes were:

- 1963 - The 2,4-D acid process was rehabilitated. The roof was raised permitting installation of new ventilating ducts to carry process fumes to a new caustic scrubber.

- 1965 - The melt, washing, and drying process for the production of dry, flaked 2,4-D was installed, with a 40 percent increase in capacity. These changes also reduced personnel contact with the 2,4-D.

- 1967 - The final plant expansion saw the construction of a new and larger 2,4-D unit and the conversion of the former 2,4-D unit to the manufacture of 2,4,5-T. The TCP purification process for dioxin removal via carbon filtration was added as part of this same expansion.

Operation at the plant continued until August 1969 when it was shut down. The production units were cleaned out as they were shut down, and between September and December the remaining raw materials and products were sold and shipped. The plant was listed for sale and remained idle throughout 1970 until it was purchased by Chemicaland Corporation in March 1971. It is noted that Chemicaland actually purchased the 1.8 acres and improvements owned by Diamond Shamrock, which then assigned rights to the 1.6 acres it had leased from Walter Ray Holding Company to Chemicaland.

Following purchase of the property by Chemicaland, equipment was installed for the manufacture of benzyl alcohol which was to be made and sold by Cloray NJ Corporation, an affiliate of Chemicaland. Production of benzyl alcohol was not profitable, so an attempt was made to expand their product line by manufacturing on a toll basis. These efforts were all unsuccessful and production ceased during the summer of 1973.

In September 1973, Chemicaland contracted with Diamond Shamrock to produce 2,4-D on a toll basis and started rehabilitating the plant so that it could again make 2,4-D. Rehabilitation of the plant was completed sometime during the spring of 1974 and production of 2,4-D resumed. Limited quantities of 2,4-D were produced during the summer of 1974, but none was delivered to Diamond Shamrock under the contract. Operations were suspended and the plant staff was laid off in September 1974.

Arrangements were then made by Chemicaland to produce 2,4-D on a toll basis for a second time and work resumed in February 1975. Limited quantities of 2,4-D were being produced by April 1975. Production of 2,4-D continued for the next 22 months, but output varied widely. Chemicaland scavenged equipment from unused processes such as TCP purification and 2,4,5-T for use in their 2,4-D unit and made temporary repairs to bypass failed equipment. The only major addition to the process known to have been made by Chemicaland was the installation of a second 2,4-D reactor during May 1976. However, this addition was soon negated by the failure of the original reactor. The maximum monthly output of 2,4-D by Chemicaland was reported to be about 500,000 pounds.

In November 1976, while they were considering acquisition of Chemicaland, Occidental Chemical Company assumed control of the management of the plant and continued to manage the plant until February 24, 1977, when they returned control of the plant to Chemicaland. Because Chemicaland did not have the resources to continue operating without the support of Occidental, they laid off all plant personnel and shut down the plant on February 24, 1977.

The property remained idle through 1980, but the ownership changed as William Leckie (the successor to Walter Ray Holding Company) purchased the 1.8 acres owned by Chemicaland in a tax sale, consolidating ownership in his name In March 1981 Leckie sold the site to Marisol, Inc.

Little is known of the use of the property by Marisol, but eventually this company started cleaning and clearing the site. Concerning the cleanup, it is known that:

- The product left in the equipment when the plant was shut down on February 24, 1977, was removed and placed in drums, of which 570 remain on site today.

- Some equipment known to be on the site following the shutdown was removed.

- Warehouse space and tankage was leased to SCA Corporation which used it in conjunction with waste disposal operations at their neighboring plant. The date that SCA started to use the site is not exactly known, but was prior to the summer of 1982.

During the spring of 1983, SCA continued to lease and use a portion of the site, while Marisol was working to prepare the office building for occupancy. This was the situation in May 1983 when results of samples taken in April by the USEPA showed high levels of dioxin on the site and NJDEP moved to control access to the property.

Present Status

Upon the discovery of the presence of high concentrations of TCDD in May of 1983, the site was evacuated and secured. All exposed soils were covered with geofabric to prevent potential migration of contamination by surface runoff and wind blown particulates. In addition, the site is guarded 24 hours per day. These provisions have been maintained and are currently in place.

IV. Remedial Investigation Findings

A. 80 Lister Avenue

A comprehensive field investigation and sampling program was developed for the remedial investigation. All activities conducted on the site were completed in accordance with a site specific workplan and health and safety plan, reviewed and approved by NJDEP. All activities were also completed under direct supervision and direction of NJDEP.

A variety of sampling activities was performed to characterize the levels of chemical contamination at the site. These included:

- Ambient air samples

- Industrial hygiene samples

- Chip, wipe, and bulk samples from existing buildings, tanks, piping, equipment, and sewers

- Samples of soil

- Samples of ground water

- Samples of Passaic River water and sediments

- Samples of background soil

- Samples of on-site drums

A more detailed discussion of the remedial investigation results follows.

Ambient Air Sampling and Results

Ten sets of ambient air samples were subjected to detailed chemical analysis. As requested by the NJDEP, those sets of samples having the ten highest iron and manganese concentrations were analyzed.

The total suspended particulate matter (TSP) concentrations ranged from 85 to 254 micrograms per cubic meter (ug/m^3) with five days recording concentrations in excess of 150 ug/m^3. The inhalable particulate matter (IPM) concentrations ranged from 56 to 196 ug/m^3; the maximum value occurred on the same day as the maximum TSP concentration. The concentration of all metals except iron were less than 1 ug/m^3 on all days. The iron concentrations ranged from 0.682 to 1.259 ug/m^3, with the maximum occurring on the day of maximum TSP and IPM concentrations.

On only two of the days chosen for analysis was any concentration of dioxin recorded. The observed concentrations were 86 picograms per cubic meter (pg/m^3) and 286 pg/m^3. Vinyl chloride was found on only five of the ten days chosen for analysis. The observed vinyl chloride concentrations ranged from 0.15 to 0.33 ug/m^3. Nine samples were analyzed for volatile organic compounds (VOC). Total VOC concentrations ranged from 71 to 182 ug/m^3.

The asbestos fiber counts were all less than 0.01 fibers per cubic centimeter. The concentrations of pesticides and polynuclear aromatics (PNA) for the samples analyzed are provided in the attached Appendix. The observed pesticide and PNA concentrations were all less than their permissible exposure levels.

All air volumes utilized in calculation of concentrations reflect calibration correction. Analytical results were used as prepared by the laboratory with adjustments for recoveries, breakthrough, or blanks.

Building and Structures Sampling and Results

Wipe, chip, and bulk samples were collected to evaluate the buildings and structures for potential contamination. Wipe samples were collected from coated floors, walls, fixtures, and air ducts. Chip samples were collected whenever possible from exposed concrete floors and building exterior or brick surfaces. All wipe and chip samples were analyzed for dioxin only. Bulk samples were taken to determine the possible presence of asbestos in insulation and other building materials. Selected bulk samples were also analyzed for dioxin.

a. Office and Laboratory Building

Of the 40 samples collected in this building, dioxin was detected in 32 and one sample was voided. Dioxin concentrations of the first floor wipe samples ranged from 38 to 1,100 ng/m^2. Dioxin concentrations of first floor chip samples ranged from 2.0 to 69.3 ppb. Fifteen of 15 first floor samples were identified as containing dioxin. Dioxin concentrations of the wipe samples taken on the second floor ranged from 10 to 14,000 ng/m^2 with 11 of the 11 valid samples having dioxin identified. The dioxin concentrations of chip samples from the exterior of the building ranged from 0.57 to 2.4 ppb with 5 of 11 samples having dioxin identified. One exterior wipe sample had a dioxin concentration of 168 ng/m^2; the other showed no dioxin present.

b. Warehouse

Of the 24 samples collected, 21 samples showed detectable levels of dioxin. The dioxin concentrations of interior wipe and chip samples ranged from 130 to 19,000 ng/m^2 and from 48.7 to 192 ppb, respectively. All 11 interior samples had positive dioxin results. The dioxin concentrations of exterior chip samples ranged from 1.0 to 16.5 ppb with 9 of 12 samples having positive results. The single exterior wipe sample showed dioxin present at 13 ng/m^2.

c. Manufacturing Building

Positive dioxin results were obtained for 27 of the 28 samples collected. The dioxin concentrations of interior chip samples ranged from 1.0 to 1,280 ppb; 14 of 14 samples collected showed positive results. The concentration range for interior wipe samples was 233 to 7,000 ng/m^2, with all four samples having dioxin identified. The dioxin concentrations of exterior chip samples ranged from 0.93 to 203 ppb, with 9 of 9 samples having positive results. Dioxin was not detected in the exterior wipe sample.

d. Process Building

All 29 samples collected had identifiable dioxin concentrations. The dioxin levels detected for the 12 interior wipe samples ranged from 60 to 41,600 ng/m^2. The dioxin concentrations of the three interior chip samples ranged from 43.2 to 696 ppb. Dioxin concentrations for the seven exterior chip samples ranged from 2.7 to 1,580 ppb. The two exterior wipe samples showed dioxin levels of 6.4 and 12 ng/m^2. The bulk samples collected ranged from 3.0 to 128 ppb with five of five samples having positive dioxin results.

e. Other Structures (Stack, Solvent Shed, pump house)

All six chip samples collected had detectable levels of dioxin ranging from 1.2 to 50.0 ppb. Dioxin was detected at 0.17 ppb in the bulk sample collected.

f. Tanks

Tank samples were taken from chemical process vessels and outside storage tanks. A total of 140 tank samples were collected with 12 being designated for dioxin analysis. Nine samples (75 percent) had positive dioxin results, with concentrations ranging from 5.0 to 60,800 ppb.

g. Sewers and Sumps Sampling and Results

Four sewer and eight sump samples were collected for dioxin analysis. Of the 12 samples taken all showed positive dioxin results, with concentrations ranging from 105-9,160 ppb.

Near Surface Soils

Twenty-one geotechnical borings were drilled on or near the site. Split-spoon and Shelby tube samples from the borings were logged according to both the USGS and Burmister classification system. Fill ranging in thickness from 8 to 15 feet is present at the surface. The fill is underlain by an organic silt which is in turn underlain by glacio-fluvial sands. On the southern portion of the site, the silt consists of an upper organic layer and a lower layer with lenses of clay and sand.

Near-surface soil samples were obtained to a depth of 60 inches. Samples from depth intervals of zero to 6 inches, 6 to 12 inches, and 12 to 24 inches were collected for the chemical analyses designated in the Work Plan. Below a depth of 24 inches, near-surface locations were continuously sampled at 12-inch intervals to a depth of 60 inches. Of the 63 near-surface soil samples analyzed for dioxin, all had identifiable dioxin concentrations ranging from 0.39 to 19,500 ppb. Forty-two near-surface soil samples were analyzed for priority pollutants. Of the 69 semi-volatile compounds, 28 were identified one or more times in the depth intervals of zero to 6 and 12 to 24 inches. At zero to 6 inches, 24 compounds were identified. For 12 to 24 inches, 26 compounds were identified excluding methylene chloride and acetone. Toluene was detected at highest concentrations (2,000,000 ppb) followed by xylenes (310,000 ppb) and chlorobenzene (84,000 ppb). Of the 38 volatile organic compounds, 13 were identified one or more times. Of the 35 herbicide, pesticide, and PCB compounds, seven were identified one or more times. DDT was detected most frequently and in highest concentration (620-5,090,000 ppb), followed by DDD (1,200-164,000 ppb), and 2,4,5-T (490-86,000 ppb). Of the 13 metals, 12 were identified one or more times. Thallium was not identified in the near-surface samples.

Boring Soil Samples

Boring soil samples were also collected at thirteen locations on site. Five samples were obtained for designated analyses at each of seven locations.

Of the 39 boring soil samples analyzed for dioxin, at depths of zero to 6 inches, the dioxin concentrations ranged from 19.7 ppb to 2,700 ppb. At 6 to 12 inches, the dioxin concentrations ranged from 7.5 ppb to 3510 ppb, and at 12 to 24 inches, the dioxin concentration ranged from 4.7 ppb to 830 ppb. Samples from directly above the silt had dioxin concentrations ranging from 0.36 ppb to 71.8 ppb. Samples from the silt zone had dioxin concentrations ranging from 0.49 ppb to 2.8 ppb with three of seven samples not having detectable concentrations of dioxin. Twenty-four boring soil samples above the silt were analyzed for priority pollutants, but samples in the silt layer were not.

Of the 69 semi-volatile compounds, 27 were identified one or more times in the samples from zero to 6 inches, 12 to 24 inches or above the silt. At zero to 6 inches, 20 compounds were identified; at 12 to 24 inches, 27 compounds were identified. In the soil samples taken from above the silt, 17 compounds were observed. Compounds detected most frequently and at highest concentration were 2,4-D (1,400,000 ppb), 2,4,5-T (270,000 ppb), and hexachlorobenzene (84,000 ppb). Of the 38 volatile organic compounds, 10 were identified one or more times in the samples from zero to 6 inches, 12 to 24 inches and above the silt. At zero to 6 inches, three compounds were identified; at 12 to 24 inches, eight compounds were identified. For samples from above silt, seven compounds were identified.

Excluding methylene chloride and acetone, only toluene (7-2,400 ppb) and chlorobenzene (49-20,000 ppb) were detected in more than 50% of the samples analyzed.

Of the 35 herbicides, pesticides, and PCB compounds, 10 were identified one or more times in the samples from zero to 6 inches, 12 to 24 inches and above the silt. At zero to 6 inches, nine compounds were identified; at 12 to 24 inches, nine compounds were identified; and in the samples from above the silt, eight compounds were identified.

Ground Water Sampling and Results

The results of the ground water investigation at the site are presented in the following discussion.

Ground water flow rates were calculated based on the calculated hydraulic conductivities and the gradients (change in head per unit distance) determined. An effective porosity of 0.30 was used for the fill. From the center of the site northward to the river, the computed ground water flow rate ranged from 0.6 to 4.0 feet per day. From the center of the site to the south, the range was 0.5 to 1.3 feet per day.

Two sets of ground water samples were collected from each of the eight original on-site monitoring wells. Based on these preliminary dioxin results, the ground water from monitoring well MW-2A was sampled a third time.

The first two rounds of ground water samples from all eight wells were analyzed for full priority pollutants plus 40 and dioxin. The third ground water sample from MW-2A was analyzed only for dioxin.

Of the 17 ground water samples analyzed for dioxin, 15 had dioxin concentrations up to 10.4 ppb. For the three ground water samples collected from MW-2A, reanalysis of 5 to 1 dilutions was required to provide results in the instrument linear calibration range. Sixteen ground water samples were analyzed for full priority pollutants. Of the 69 semi-volatile compounds, 19 were identified in the initial round of samples, 24 compounds were identified in the second round of samples. Compounds detected most frequently and at highest concentration were 2,4-D (58,000 ppb), 2,4,5,-T (26,000 ppb), and 2,4,6-TCP (11,000 ppb). Of the 38 volatile organic compounds, 18 were identified one or more times in each of the two rounds of sampling. Compounds detected most frequently and at highest concentration were chlorobenzene (23,000 ppb), benzene (7,900 ppb), and toluene (3,300 ppb).

Of the 35 possible herbicides, pesticides and PCB compounds, eight were identified one or more times in the first round samples and six compounds were identified in the second round samples. Compounds detected most frequently and at highest concentration were 2,4-D (27,000 ppb), DDT (22,000 ppb), and 2,4,5-T (5,600 ppb). Of the 13 metals, 11 were identified one or more times in the first round samples and 12 metals were identified in the second round samples.

Passaic River Water and Sediment Sampling and Results

Two Passaic River water samples were collected concurrent with the ground water sampling for the eight on-site wells. Both samples were analyzed for dioxin and full priority pollutants. Both samples had non detectable (ND) results for dioxin at 0.004 ppb and 0.007 ppb detection limits respectively.

Of the 38 volatile organic compounds, six were detected in the first sample and five were detected in the second. Only two of the 69 semi-volatile compounds were detected in the first sample and one semivolatile compound in the second sample. Only two of the 35 total herbicide/pesticide/PCB's were detected in the first water sample, none were detected in the second. Of a possible 13 metals, four were detected in both Passaic River water samples.

Sediment samples were taken at twenty-three locations in the Passaic River in the vicinity of the site. In total, 36 samples were collected for dioxin--23 samples at depths of zero to 12 inches and 13 samples at depths of 12 to 24 inches. Fifteen priority pollutant samples were taken, 10 samples at depths of zero to 12 inches and five samples at depths of 12 to 24 inches.

Of the 36 Passaic River sediment samples analyzed for dioxin, 26 samples had identifiable dioxin concentrations. At zero to 12 inches, the dioxin concentrations ranged from 0.53 to 10.8 ppb with six samples having non detectable dioxin concentrations at a detection limit of 0.78 ppb. At 12 to 24 inches, the dioxin concentrations ranged from 0.63 to 130 ppb with four samples having non detectable dioxin concentrations at the 0.78 ppb detection limit.

Of the 69 semi-volatile compounds, 17 were identified one or more times in the zero to 12 inch or 12 to 24 inch samples. Fourteen compounds were identified at zero to 12 inches. Seventeen compounds were identified at 12 to 24 inches.

Of the 38 volatile organic compounds, 10 were identified in one or more samples at the zero to 12 inch or 12 to 24 inch depths. Eight compounds were identified at depths of zero to 6 inches. Ten compounds were identified at depths of 12 to 24 inches.

Of the 35 herbicide, pesticide, and PCB compounds, 11 were identified one or more times in the zero to 12 inch or 12 to 24 inch samples. Ten compounds were identified at depths of zero to 12 inches. Eight compounds were identified at 12 to 24 inches. Of the 13 metals, 11 were identified one or more times in the zero to 12 inch or 12 to 24 inch samples

Background Samples and Results

Samples were taken and analyzed for priority pollutant and dioxin analysis at four locations off the site. Three samples were taken at Harrison Avenue, Raymond Boulevard, and Roanoke Avenue in Newark, New Jersey. Samples from Boring B-14 on the adjoining Sherwin-Williams property used for the installation of a monitoring well were also used to establish background levels of dioxin and priority pollutants.

Sherwin-Williams

Five samples were taken from the Sherwin-Williams property for analysis. Samples collected at depths from zero to 6 inches, 6 to 12 inches, 12 to 24 inches, immediately above the silt zone, and in the silt zone were analyzed for dioxin. Samples from depths of zero to 6 inches, 12 to 24 inches, and immediately above the silt were analyzed for dioxin and priority pollutants. Three of the five samples taken had detectable concentrations of dioxin. Of the 69 acid/base/neutral compounds, 20 were reported one or more times in the three samples analyzed. Of the 38 volatile organic compounds, three were reported one or more times; of the 35 herbicide, pesticide, and PCB compounds, two were reported one or more times; and of the 13 metals, 11 were reported all three times.

Newark

Samples collected at Harrison Avenue, Raymond Boulevard, and Roanoke Avenue were taken to establish a background for the area. These areas were considered to be representative of conditions prevalent within the city of Newark. Three samples were collected at depths of zero to 6 inches and analyzed for priority pollutants and dioxin.

Of the 69 semi-volatile compounds, 16 were identified in the Newark background samples one or more times. Compounds detected most frequently and at highest concentration were hexachlorobenzene (620,000 ppb), chrysene (3,700 ppb) and fluorene (2,800 ppb). Of the 35 herbicide, pesticide, and PCB compounds, three were detected one or more times with PCB being detected. Of the 11 metals, 11 were identified one or more times. Positive total cyanide and phenol results were reported for four of the six samples analyzed.

On-Site Drums Sampling and Results (Waste Categorization)

Subsequent to sampling and initial field testing of each drum, individual samples were composited for further waste categorization testing. Composites were limited to six drums per composite grouping and were based on such similarities as pH, drum content, and physical appearance. The major purpose of compositing drum samples was to survey the drums for dioxin contamination and to categorize their preliminary waste and hazard characteristics.

Composite drum samples and certain individual drums were tested for gross physical properties or waste categorization parameters.

Ten parameters were examined in the drum sampling program. They were:

- Water reactivity - solubility
- Water reactivity - temperature change
- Percent lower explosive limit (LEL)
- pH
- Presence of oxidizable materials (OX)
- Presence of peroxides (peroxide)
- Sample type
- Open cup ignitability
- Open cup flashpoint
- Presence of halogens (halogens).

The results of this sampling event will be used to determine disposal alternatives and methodology. All drums are currently secured on site and monitored.

- Dioxin Analysis

  Dioxin analysis was performed on 22 selected drum samples. Drums to be tested were selected by one of two criteria--either the drum was representative of a major group of drums or it had some particular association with the manufacturing process. Of the 22 drums analyzed, 15 showed positive results, ranging from a low of 1.5 ppb to a high of 12,200 ppb. Seven of the 22 samples had no detectable quantity of dioxin present. If the result for a particular drum was positive for dioxin, all the drums in its associated composite were also considered contaminated.

A summary of the results of the remedial investigation is presented in tabular form as an Appendix.

B. 120 Lister Avenue

Similar to 80 Lister Avenue, a comprehensive field investigation and sampling program was developed for the remedial investigation of the 120 Lister Avenue property. All activities conducted at the site were completed in accordance with a site specific work plan and health and safety plan, reviewed and approved by NJDEP. All activities were also completed under direct supervision and direction of NJDEP.

A variety of sampling activities was performed to characterize the levels of chemicals contamination at the site. These included:

- Ambient air samples
- Industrial hygiene samples
- Chip, wipe, and bulk samples from existing buildings, tanks, trailers and equipment
- Soil samples
- Ground water samples
- Surface water samples
- Drum samples

A more detailed discussion of the remedial investigation result follows.

Ambient Air Sampling and Results

Eighty-six ambient air samples were collected on the 120 Lister Avenue site. Of the 86 samples, 18 (21 percent) were analyzed for dioxin only. Of the 18, 5 were not reported due to laboratory complications. Of the 13 reported ambient air results, 12 had non-detected dioxin concentrations. One sample had an identified dioxin concentration of 33.5 pg/m^3 , however, due to matrix interference(s), analysis did not meet all of the identification criteria for dioxin, and therefore the identification was considered tentative.

Building and Structures

Chip and wipe samples were collected from the buildings and structures at the 120 Lister Avenue site to evaluate potential contamination. Chip samples were collected from the interior walls, exterior walls, floor, and roof of each of the three buildings. Wipe samples were collected from the tanks, trailers, equipment, and assorted hardware and supplies.

a. Buildings

Of the 18 chip samples collected from the three buildings on the 120 Lister Avenue site, positive dioxin results were obtained for half (9) of these samples, however, none of the results exceeded the action level of 7.0 ppb. Dioxin concentration in the 9 chip samples ranged from 0.13 ppb to 6.3 ppm.

b. Tank, Trailers, and Equipment

Sixteen wipe samples were collected from the tanks, trailers, and equipment located at the 120 Lister Avenue site. Two of the 16 samples were positive for dioxin with concentrations of 7.9 ng/m^2 and 11.0 ng/m^2.

Soils

A total of 23 geotechnical borings were drilled at the site. Split spoon and Shelby tube samples from the borings were logged according to both the USGS and Burmeister Classification Systems, similar to the investigation completed for 80 Lister Avenue .

Of the 72 samples analyzed for TCDD to a depth of 60 inches, 54 had identifiable concentrations ranging from 0.19 to 490 ppb. Of the 15 samples analyzed for TCDD from 60 to 132 inches, 10 had identifiable concentrations of TCDD ranging from 0.23 to 93.7 ppb.

A total of 42 soil samples from the 120 Lister Avenue site were analyzed for full priority pollutant parameters and dioxin. Samples were collected and analyzed for depths ranging from 0 to 11 feet.

Of the 69 semi-volatile compounds, 13 were identified one or more times. Bis(2-ethylhexyl) phathalate was detected most often and at highest concentration (up to 90,000 ppb), followed by pyrene (up to 39,000 ppb). Of the 38 volatile organic compounds, 3 were identified one or more times. Methylene chloride (up to 750 ppb) and chlorobenzene and benzene (up to 120 ppb) were the volatile organics identified. Of the 35 herbicide, pesticide, and PCB compounds, five were identified one or more times, with 4,4-DDT being detected at the highest concentration (up to 480,000 ppb) followed by alpha-BHC (up to 50,000 ppb).

Ground Water Sampling and Results

Based upon the ground water level measurements and slug tests performed in the six monitor wells on 120 Lister Avenue, estimates of the ground water flow directions and associated rates were calculated. Estimates of the vertical flow of ground water from the fill material through the silt to the glacio-fluvial sand deposit were also determined.

Ground water flow velocities in the surficial fill at 120 Lister Avenue were computed from the gradients (piezometric head divided by distance) and the hydraulic conductivities. Computed horizontal ground water velocities ranging from 2.2 to 3.1 feet per day from the center of the site north towards the river and from 0.3 to 0.6 feet per day form the center of the site to the southern boundary.

The vertical hydraulic gradient and an estimate of the vertical hydraulic conductivity of the silt layer were used to calculate the ground water velocities from the fill through the silt into the underlying sand unit. Assuming an average silt layer thickness of 8.5 feet, the average computed velocity is 1.6x10^{-3} feet per day.

Hydraulic conductivity testing in the glacio-fluvial sand indicated an average value of 2.32 feet per day in the upper sand unit and 0.23 feet per day in the lower sand unit.

Five ground water samples were collected from the 120 Lister Avenue site and analyzed for full priority pollutants and dioxin.

Dioxin was not detected in any of the five ground water samples taken from the 120 Lister Avenue site. A total of 23 organic compounds were detected at least once. Of these 23, benzene, chlorobenzene, and 4,4-DDT were detected with the highest frequency. Concentrations of the detected organics ranged from 0.3 ppb for B-BHC to 790 ppb for 2,4,-Dichlorophenol.

Of the 14 inorganic compounds analyzed for, 14 were identified ranging in concentration from 0.01 ppb for total phenol to 36 ppb for Zinc.

Surface Water Sampling and Results

Prior to disposal of water used on site during the investigation, sampling was conducted to determine if dioxin was present. In addition, several other parameters, including COD, BOD, TOC, and TDS were analyzed.

Of the two samples analyzed, one had a detectable concentration of 0.013 ppb TCDD. The other sample was non-detect at a detection limit of 0.0019 ppb.

Drum Sampling and Results

Eighteen drums samples were analyzed for hazardous waste characterization, EP toxicity and PCBs. Samples were also taken for TCDD analysis and have been placed in archieve for possible future analysis.

V. Risks Presented by the Site

As previously reported in earlier sections of this ROD, the results of the remedial investigation indicate that the site is contaminated by a large number of hazardous substances. Chemicals presenting especially great risks because of their toxicities and concentrations are TCDD and DDT. The contamination at the site is widespread, affecting most media including soils, structures, ground water and air. Routes for exposure to these hazardous substances are discussed below.

Direct On-Site Contact

The following measures have been taken to lessen the risk of direct on-site exposure of humans to hazardous substances:

- Access to the site is controlled by fencing and by a 24-hour security service
- Those persons authorized for site access are required to wear protective clothing and equipment
- A geotextile fabric covering the site minimizes the potential for direct contact with soil

As a result of these measures, the risk of on-site exposure is currently not a concern.

Migration of Hazardous Substances to the Passaic River

The remedial investigation indicates that hazardous substances are being released from the site to the Passaic River through the routes of ground water migration and surface runoff of stormwater. The remedial investigation also identified TCDD and other hazardous substance in Passaic River sediments. A separate study of the contamination of Passaic River sediments is being conducted by Diamond Shamrock. Results of that study show that the more recent sediments contain relatively little TCDD compared to older sediments. The data suggests that releases of TCDD to the Passaic River were much greater in the past during the period of pesticide production at the site than at the present. TCDD has also been found in biota from the Passaic River and nearby water.

The releases of hazardous substances from the site to the Passaic River present a continuing risk to the environment and to humans who may ingest contaminated fish and shellfish. The latter risk has been reduced by NJDEP's advisories against fish consumption and ban on commercial fishing.

Migration of Hazardous Substances to Deeper Aquifers

A component of the contaminated ground water in the fill layer flows downward into the lower aquifers which are influenced by industrial wells in the area. Since there are no potable wells in the area, ingestion of contaminated ground water is not a great concern at this time. However, there is still some risk of exposure via the industrial wells pumping from the deeper aquifers. The fact that the migration of TCDD and DDT in ground water is attenuated by adsorption of these compound on soil substantially reduces this risk.

Migration of Airborne Hazardous Substances

Hazardous substances can be released from the site into the air by volatilization and by dust generation. While the geotextile fabric reduces dust generation form the soil, the buildings and structures at the site are a potential source of airborne dust. As previously reported in this ROD, TCDD and other hazardous substances were measured in ambient air samples taken on-site. Inhalation of airborne hazardous substances migrating off-site is an exposure route. Control of air emissions from the site will be a prime concern during remedial activities since the remedial activities can be expected to generate dust and expose volatile chemicals to the air.

Chapter 3 of the Feasibility Study Report quantifies some of the risks discussed about and provides a more detailed analysis.

VI. The Criteria for Remedy Selection

1. The Law and Regulations that Govern this ROD

EPA's selection of a remedial alternative must be in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), 42 U.S.C. Secs. 9601 *et seq.*, as amended by the Superfund Amendments and Reauthorization Act (SARA) (enacted October 17, 1986), and the requirements of its governing regulations, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Part 300. Accordingly, the Agency has selected a remedy that is consistent with its governing statute.

2. The Substantive Legal Requirements

Under its legal authorities, EPA's responsibility at Superfund sites is to undertake remedial actions that are necessary in order to protect the public health and welfare and the environment. In Section 121 of SARA, Congress provides guidelines which the Agency must follow in selecting remedies which assure protection of human health and the environment. These guidelines are discussed below.

First, in Section 121(b), Congress creates a statutory preference for remedial actions in which treatment permanently and significantly reduces the volume, toxicity or mobility of the hazardous substance, pollutants or contaminants. In assessing various permanent solutions, EPA must specifically address the long-term effectiveness of the different alternatives. EPA shall, at a minimum, take into account:

(A) the long-term uncertainties associated with land disposal;
(B) the goals and requirements of the Resource Conservation and Recovery Act (RCRA);
(C) the persistence, toxicity, mobility and propensities of the hazardous substances and constituents to bioaccumulate;
(D) the short and long-term potential for adverse health effects from human exposure;
(E) long-term maintenance costs;
(F) the potential for future remedial action costs if the alternative remedial action in question were to fail;
(G) the potential threat to human health and the environment associated with excavation, transportation, and redisposal, or containment.

Congress prescribes that in choosing its final remedy, EPA must select a remedial action that uses permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable.

Second, pursuant to Section 121(c), if EPA selects a remedial action that results in any hazardous substance, pollutants or contaminants remaining at the site, EPA must review such remedial action at least every 5 years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgement of EPA that action is appropriate at such site in accordance with Section 104 or 106, EPA must take or require such action.

Third, in Section 121(d)(2), Congress provides that EPA's remedial action, when conducted on-site, must comply with applicable or relevant and appropriate environmental standards established under Federal and State environmental laws (such applicable or relevant and appropriate requirements sometimes will be referred to as ARARs). However, Section 121(d)(4) allows EPA to select a remedy that does not comply with all ARARs, if EPA finds that:

(A) the remedial action selected is only part of a total remedial action that will attain such level or standard of control when completed;

(B) when compliance with such requirement at that facility will resultin greater risk to human health and the environment than alternative options;

(C) compliance with such requirements is technically impracticable from an engineering perspective;

(D) the remedial action selected will attain a standard of performance that is equivalent to that required under the otherwise applicable standard, requirement, criteria, or limitation, through use of another method or approach;

(E) with respect to a State standard, requirement, criteria, or limitation, the State has not consistently applied (or demonstrated the intention to consistently apply) the standard requirement, criteria, or limitation in similar circumstances at other remedial actions within the State; or

(F) in the case of a remedial action to be undertaken solely under Section 104 using the Fund, selection of a remedial action that attains such level or standard of control will not provide a balance between the need for protection of public health and welfare and the environment at the facility under consideration, and the availability of amounts from the Fund to respond to other sites which present or may present a threat to public health or welfare or the environment, taking into consideration the relative immediacy of such threats.

Fourth, in Section 121(d)(3), Congress established requirements for actions involving the transfer of any hazardous substance or pollutant or contaminant off-site (e.g., to an off-site commercial treatment or disposal facility). This Section requires that the off-site facility be operating in compliance with Section 3004 and 3005 of RCRA (or, where applicable in compliance with other applicable Federal law) and with all State requirements. In addition, this Section provides further restrictions regarding the use of off-site land disposal facilities that are releasing hazardous waste or hazardous waste constituents to ground water, surface water or soil.

In addition, Section 121 (a) requires the selection of a remedy which, in addition to meeting all other criteria of Section 121, provides for cost-effective response. In evaluating cost-effectiveness of remedial alternatives, EPA must take into account the short-term and long-term costs of these alternatives including the costs of operation and maintenance for the entire period during which such activities will be required.

VII. Description and Evaluation of Remedial Alternatives

The remedial alternatives which were developed in detail in the Feasibility Study are listed and briefly described in Table I. Cost estimates for these remedial alternatives are presented in Table II. A detailed description of the process for screening remedial technologies and developing remedial alternatives is found in the Feasibility Study report. For each remedial alternative, a description and evaluation follows.

Alternative 1 - No Action

The no-action alternative includes the maintenance of the site fence, geotextile fabric, security systems, and the establishment of an ongoing monitoring program. The site would essentially remain as it currently exists except that all materials remaining on 120 Lister Avenue (east of the fence separating 80 Lister Avenue from 120 Lister Avenue) with dioxin concentrations in excess of 7 ppb will be transferred to 80 Lister Avenue for storage.

The risks presented by the site after implementing Alternative 1 would be essentially the same as those discussed previously in Section V of this ROD. In view of these risks, Alternative 1 (no action) does not assure protection of the environment or of human health. Since Section 121 (d) (1) of CERCLA requires that the selected remedy assure such protection, Alternative 1 cannot be selected.

Alternative 2 - On-Site Containment with Cap and Slurry Wall

This alternative would rely on the on-site containment of wastes by the construction of an impermeable barrier (slurry wall) and a cap meeting RCRA requirements (see Figures 5 and 6). Only a portion of 120 Lister Avenue where soil concentrations of dioxin are less than 7 ppb would be outside of the containment area.

There are a number of additional components of this remedial alternative. The buildings would be demolished and the rubble spread and compacted over the site. The contents of shipping containers currently on 120 Lister Avenue would be emptied, spread and compacted over the site. Underground conduits, including utility lines and sewer systems which have not already been sealed, would be located by perimeter excavation, plugged at the exterior of the site, and completely filled within the interior of the site with grout. Several tanks and major structural steel components would be cleaned and hauled off-site for reclamation, resale, or disposal as non-hazardous waste. A new bulkhead would be installed to increase the stability of the river bank. Drummed liquids and process wastes would be stabilized and immobilized. A monitoring program would be established and maintained.

The underlying design principle of this alternative is to substantially reduce the movement of chemical contaminants, especially dioxin and DDT, by containment of the waste. The site geologic and hydrogeologic conditions coupled with the geochemical characteristics of dioxin and DDT make this alternative a possible remedial option for the containment of these

Table I

Remedial Alternatives

Alternative 1 - NO ACTION

Alternative 2 - Slurry wall and Cap - Demolition of structures, decontamination, grading, and in-situ containment of all waste with a slurry wall and cap.

Alternative 3 - Slurry wall and Cap, Groundwater treatment - Demolition of structures, decontamination, grading, and in-situ containment of all waste with a slurry wall and cap, with continued pumping and treatment of the groundwater.

Alternative 4 - Excavation and On-Site Thermal Treatment - Demolition of structures, decontamination, grading, excavation, on-site treatment of groundwater, and thermal treatment of all site wastes and soils containing dioxin above 7 ppb with in-situ containment of the remaining site soils and treated materials with a slurry wall and cap.

Alternative 5 - Excavation and On-Site Vault - Demolition of structures, decontamination, grading, excavation, on-site treatment of groundwater, and vault encapsulation of all site wastes and soils containing dioxin above 7 ppb with in-situ containment of the remaining soils with a slurry wall and the vault.

Alternative 6A - Excavation and Off-Site Disposal - Demolition of structures, decontamination, grading, excavation, on-site treatment of groundwater, and hauling of waste and soils containing dioxin above 7 ppb to an off-site facility for landfill disposal; soils remaining with dioxin levels below 7 ppb would be contained by a slurry wall.

Alternative 6B - Demolition of structures, decontamination, grading, excavation, on-site treatment of groundwater, and hauling of waste and soils containing dioxin above 7 ppb to an off-site facility for "thermal treatment."Soils remaining with dioxin levels below 7 ppb would be contained by a slurry wall.

Table II

Cost Summary of Alternatives

Alternative	Capital Cost Estimate	Capital Cost Range	Cost Present Value	Annual Operating and Maintenance Costs
1	$422,000	$380,000-464,000	$2,600,000	$237,000
2	$8,013,000	$6,410,000-9,616,000	$8,350,000	$165,000
3	$8,068,000	$6,469,000-9,703,000	$9,320,000	$261,000
4	$60,096,000	$54,086,000-75,120,000	$46,620,000	$112,000
5	$16,879,000	$13,503,000-20,254,000	$14,180,000	$116,000
6A	$51,272,000	$46,145,000-66,653,000	$39,460,000	$62,000
6B	$247,808,000	$223,027,000-322,150,000	$188,460,000	$62,000

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APPROVED BY 09-30-85
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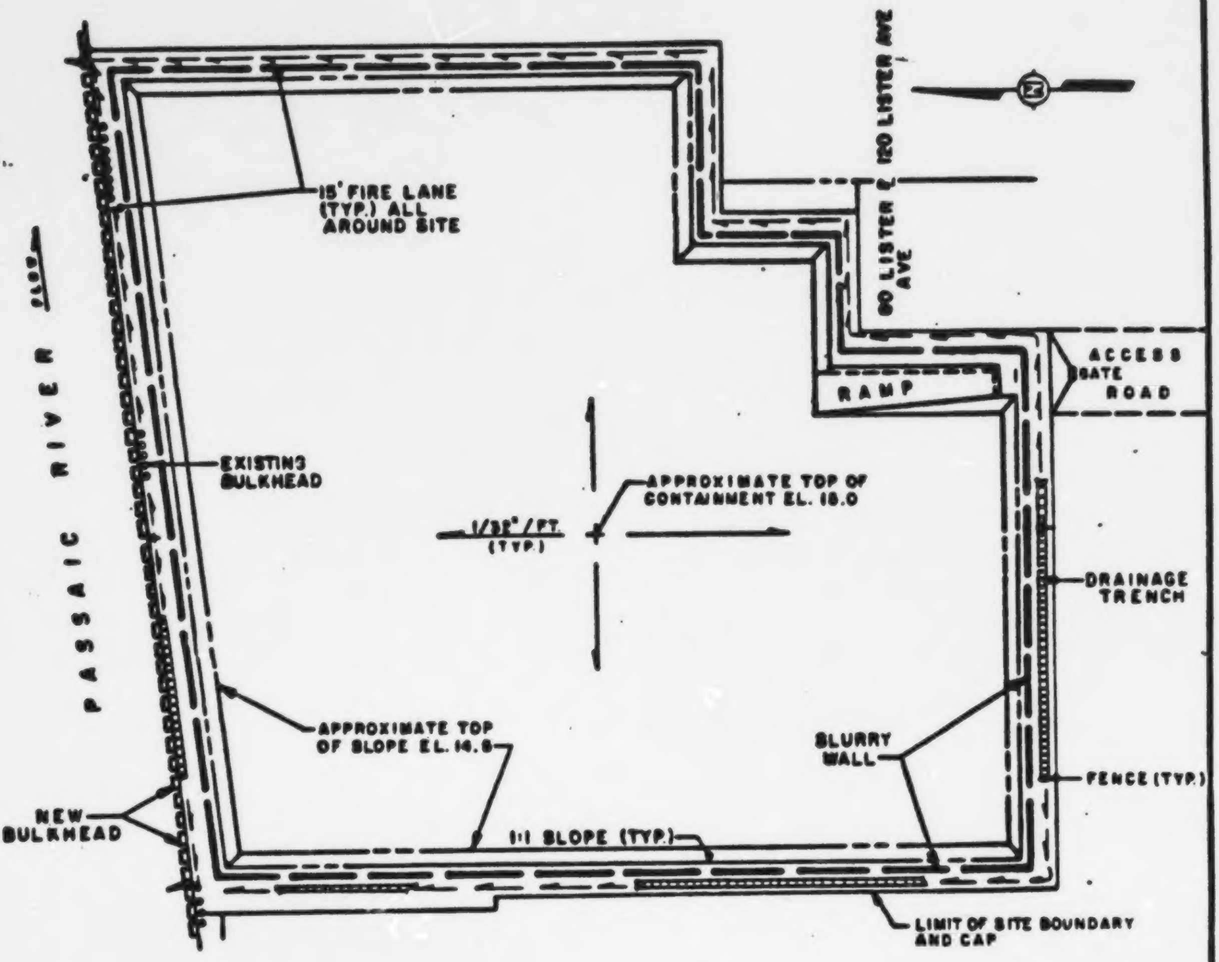
80 LISTER AVE
15' FIRE LANE (TYP.) ALL AROUND SITE
90 LISTER & 120 LISTER AVE
80 LISTER AVE
ACCESS GATE ROAD
RAMP
PASSAIC RIVER
EXISTING BULKHEAD
APPROXIMATE TOP OF CONTAINMENT EL. 18.0
1/32" / FT. (TYP.)
DRAINAGE TRENCH
APPROXIMATE TOP OF SLOPE EL. 14.5
SLURRY WALL
FENCE (TYP.)
NEW BULKHEAD
1:1 SLOPE (TYP.)
LIMIT OF SITE BOUNDARY AND CAP

NOTE:
THIS PLAN IS CONCEPTUAL AND THE DETAILS OF THE DESIGN WILL BE FINALIZED PRIOR TO IMPLEMENTATION.

FIGURE 5

CONCEPTUAL SITE PLAN
ALTERNATIVES 2 & 4
80 LISTER AVENUE
PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

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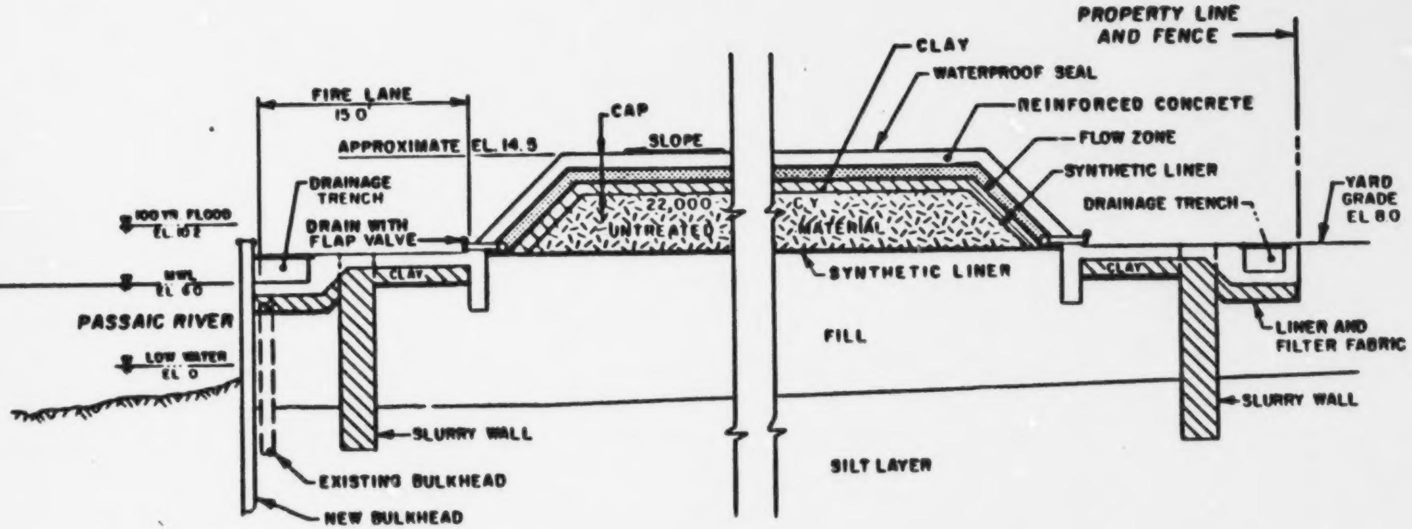
PROPERTY LINE AND FENCE
CLAY
WATERPROOF SEAL
REINFORCED CONCRETE
FLOW ZONE
SYNTHETIC LINER
DRAINAGE TRENCH
YARD GRADE EL 8.0
FIRE LANE 15.0
CAP
APPROXIMATE EL. 14.5
SLOPE
DRAINAGE TRENCH
DRAIN WITH FLAP VALVE
100 YR FLOOD EL 10.2
MWL EL 6.0
PASSAIC RIVER
LOW WATER EL 0
22,000 C.Y. UNTREATED MATERIAL
SYNTHETIC LINER
CLAY
CLAY
FILL
LINER AND FILTER FABRIC
SLURRY WALL
SLURRY WALL
SILT LAYER
EXISTING BULKHEAD
NEW BULKHEAD
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NOTE:
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FIGURE 6

CONCEPTUAL CROSS SECTION
LOOKING EAST
ALTERNATIVE 2
80 LISTER AVENUE
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contaminants on site. A low-permeability silt layer with an average thickness of about nine feet underlies the fill and mitigates the downward migration of the chemical constituents. Furthermore, dioxin is strongly absorbed by media with organic and clay content (such as the silt layer) and its rate of migration in such media would be greatly retarded. The behavior of DDT in the silt layer would be similar. Therefore, the silt layer provides a natural barrier to mitigate downward migration of dioxin and DDT. Testing indicated that the permeability of the silt is approximately 10^{-7} centimeters per second (cm/sec).

The slurry wall would provide a lateral barrier and, with the cap, would encapsulate the wastes. The slurry wall would be constructed of clay and bentonite and have a permeability of 10^{-7} cm/sec or less. The cap, which would include a layer of compacted clay (permeability of 10^{-7} cm/sec) and a nearly impermeable synthetic membrane liner, would virtually eliminate downward seepage of surface water into the contained volume.

After installation of Alternative 2, the RCRA cap would adequately control the risks resulting from direct on-site contact and from airborne migration of hazardous substances. The risk of further contamination of the Passaic River by the site would also be adequately controlled. Surface runoff from the site to the Passiac River would be uncontaminated because the cap will eliminate stormwater contact with hazardous substances. Downward migration of contaminated ground water through the silt layer to deeper aquifers would continue but would be reduced with time as the water level within the contained volume is gradually lowered by the downward flow. Eventually the rate of downward groundwater migration through the silt layer would be reduced to the rate of water infiltration through the nearly impermeable cap and slurry wall. When this condition occurs, the flow of groundwater through the slurry wall will be into the contained volume due to the lowered water level within the contained volume. Therefore, there would be no migration of groundwater from the contained volume through the fill layer to the Passaic River. Alternative 2 should assure substantial protection of human health and the environment, although it would allow some continued release of hazardous substances to the groundwater.

Alternative 2 does not involve substantial treatment of hazardous substances, although the drummed process wastes would be treated to reduce the mobility of hazardous substances prior to the burial of these wastes. Therefore, Alternative 2 does not satisfy the preference for treatment expressed in Section 121(b) of CERCLA.

Alternative 2 would require minimal routine operation and maintenance activities. The cap would need to be inspected for erosion or cracking and repairs made as needed. . However, with the passage of time the permeability of the cap and slurry wall may increase due to deterioration of materials with age or as a result of chemical attack. This condition would not result in a sudden failure of the remedy but to a gradual reduction in effectiveness. Should monitoring show this to be the case, repairs could be made such as installation of another slurry wall or reconstruction of the cap. Alternatively, a different remedy could be implemented at that time.

Alternative 2 would not comply with the land disposal ban of Section 3004(e) of RCRA and the associated regulations (40 CFR Sec. 268.31 - see page 40642 of the November 7, 1986 Federal Register), which prohibit the land disposal of listed dioxin wastes after November 8, 1988. Alternative 2 would also not comply with the RCRA standards for landfill design (see 40 CFR Part 264, Subpart N) which require a double liner and double leachate collection system. The landfill proposed in Alternative 2 for disposal of stored wastes and demolition debris has no bottom liners or leachate collection systems.

With the exception of the no action alternative, Alternative 2 is the least costly of the alternatives. This would be the case even if it is assumed that the remedial alternatives involving containment would have to be periodically reconstructed to maintain their effectiveness. It can also be implemented quickly (construction would take approximately 2 years) and is without any anticipated implementation problems.

Alternative 3 - On-Site Containment with Cap, Slurry Wall, and Groundwater Pumping and Treatment

This alternative is similar to Alternative 2 except that purge wells would be installed in the containment area to pump ground water for treatment. A wastewater treatment plant would be constructed on-site to treat the pumped ground water prior to discharging it either to the Passaic River or to the local publicly owned treatment works. The conceptual design for this alternative is shown in Figures 7 and 8.

After installation of Alternative 3, the RCRA cap would adequately control the risks resulting from direct on-site contact and from airborne migration of hazardous substances. The risk of further contamination of the Passaic River by the site would be greatly reduced. Surface runoff from the site to the Passaic River would be uncontaminated because the cap will eliminate stormwater contact with hazardous substances. The pumping of groundwater would lower the water level in the contained volume toward the top of the silt layer. Since the water table within the contained volume would then be lower than the water table outside the slurry wall, any lateral migration of groundwater through the slurry wall would be into the contained volume. Because the potentiometric surface of the sand unit below the silt layer is, on the average, two feet above the top of the silt layer, the groundwater pumping would cause an upward flow of groundwater from the sand unit through the silt layer into the contained volume. This would virtually eliminate releases from the contained volume to the groundwater. There would be a discharge of treated groundwater to the Passaic River as a result of the implementation of this remedy. The treatment system would be designed to meet the effluent limitations specified in Section VIII of this ROD. As described in Section VIII, the level of treatment provided to achieve these effluent limitations will result in adequate protection of the Passaic River. Therefore, Alternative 3 would assure protection of human health and the environment.

Alternative 3 does not rely primarily on the treatment of hazardous substances, although some treatment would be required. Specifically, the drummed process wastes would be treated to reduce the mobility of hazardous substances prior to the burial of these wastes and the pumped groundwater would be treated to achieve the effluent limitations specified in Section VIII. Therefore, Alternative 3 does not fully satisfy the preference for treatment expressed in Section 121(b) of CERCLA.

Alternative 3 would require operation and maintenance of the groundwater pumping and treatment system for the foreseeable future. In addition, the cap would need to be inspected for erosion or cracking and repairs made as needed. However, with the passage of time, the permeability of the cap and

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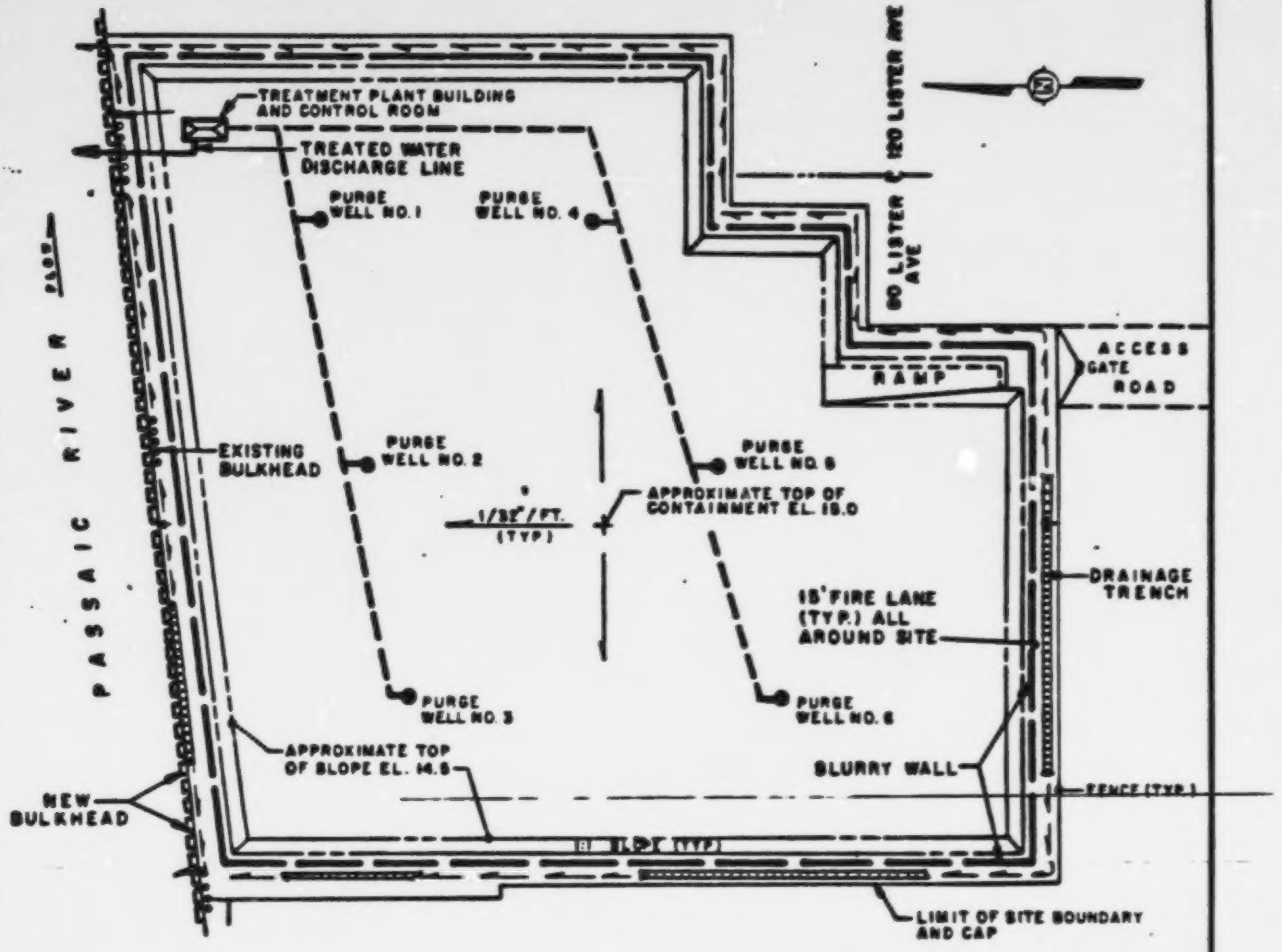
TREATMENT PLANT BUILDING AND CONTROL ROOM
TREATED WATER DISCHARGE LINE
PURGE WELL NO. 1
PURGE WELL NO. 4
120 LISTER AVE
80 LISTER AVE
PASSAIC RIVER
FLOW
ACCESS ROAD
GATE
RAMP
EXISTING BULKHEAD
PURGE WELL NO. 2
PURGE WELL NO. 5
1/32"/FT. (TYP)
APPROXIMATE TOP OF CONTAINMENT EL. 15.0
DRAINAGE TRENCH
15' FIRE LANE (TYP.) ALL AROUND SITE
PURGE WELL NO. 3
PURGE WELL NO. 6
APPROXIMATE TOP OF SLOPE EL. 14.5
SLURRY WALL
NEW BULKHEAD
FENCE (TYP.)
3:1 SLOPE (TYP)
LIMIT OF SITE BOUNDARY AND CAP

NOTE:
THIS PLAN IS CONCEPTUAL AND THE DETAILS OF THE DESIGN WILL BE FINALIZED PRIOR TO IMPLEMENTATION.

FIGURE 7
CONCEPTUAL SITE PLAN
ALTERNATIVE 3
80 LISTER AVENUE
PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

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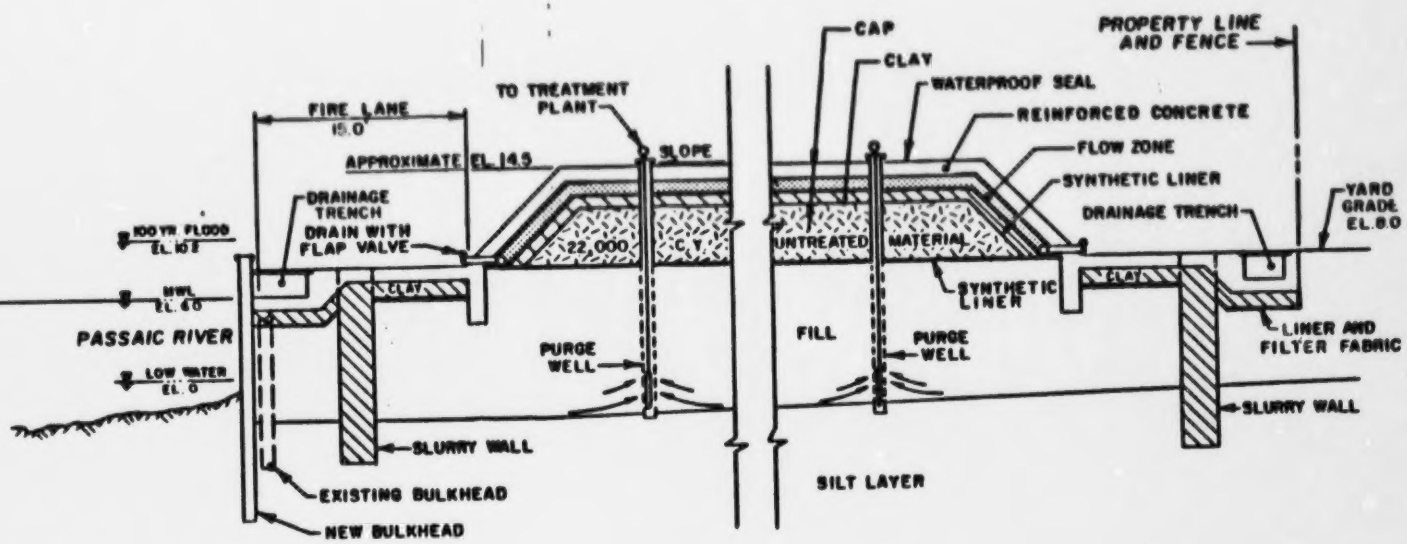
FIRE LANE
15.0'
TO TREATMENT PLANT
APPROXIMATE EL. 14.5
SLOPE
100 YR. FLOOD EL. 10.?
MWL EL. 6.0
PASSAIC RIVER
LOW WATER EL. 0
DRAINAGE TRENCH
DRAIN WITH FLAP VALVE
CLAY
22,000 C.Y.
UNTREATED MATERIAL
PURGE WELL
PURGE WELL
FILL
SLURRY WALL
EXISTING BULKHEAD
NEW BULKHEAD
SILT LAYER
CAP
CLAY
WATERPROOF SEAL
REINFORCED CONCRETE
FLOW ZONE
SYNTHETIC LINER
SYNTHETIC LINER
DRAINAGE TRENCH
PROPERTY LINE AND FENCE
YARD GRADE EL. 8.0
LINER AND FILTER FABRIC
SLURRY WALL

NOTE:
THIS CROSS SECTION IS CONCEPTUAL AND THE DETAILS OF THE DESIGN WILL BE FINALIZED PRIOR TO IMPLEMENTATION.

FIGURE 8

CONCEPTUAL CROSS SECTION
LOOKING EAST
ALTERNATIVE 3
80 LISTER AVENUE

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slurry wall may increase due to deterioration of materials with age or as a result of chemical attack. This would gradually result in greater influx of groundwater into the contained volume and greater flow of groundwater to the treatment system. Since the treatment system would be designed to accommodate increased flows and still achieve the required effluent limitations, the effectiveness of the remedy would be maintained (although operating costs would increase with greater volumes of water being treated). Should a significant increase in groundwater influx occur, repairs could be made such as installation of another slurry wall or reconstruction of the cap. Alternatively, a different remedy could be implemented at that time.

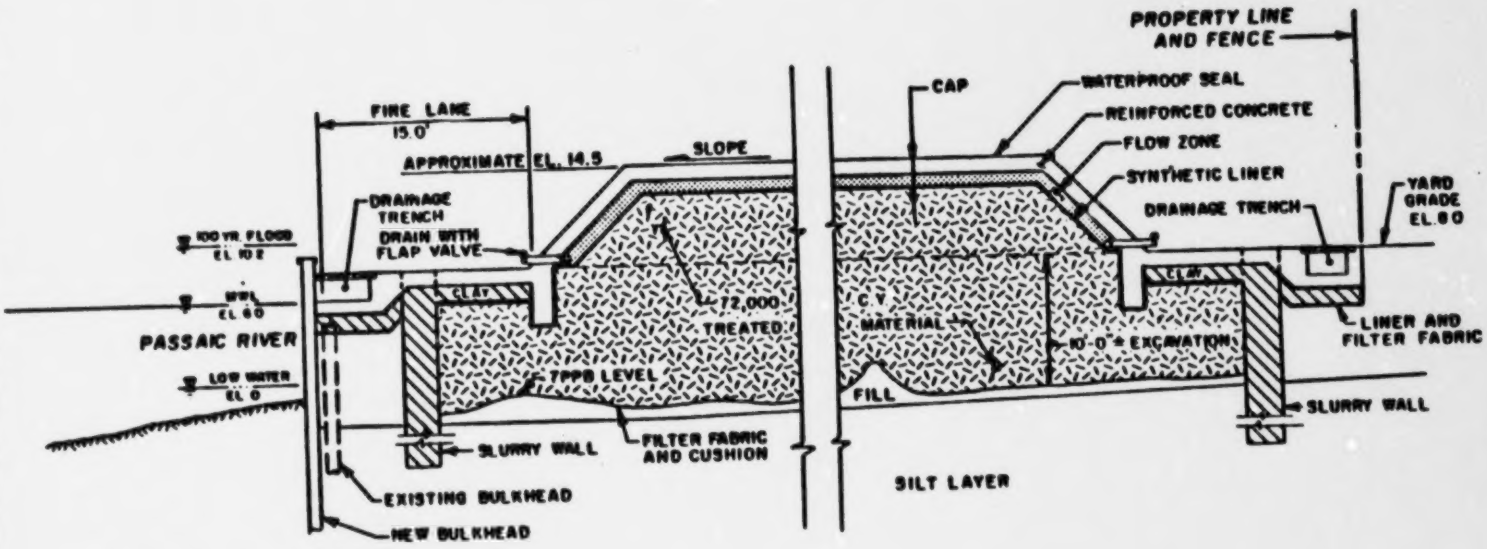
Alternative 3 would not comply with the land disposal ban of Section 3004(e) of RCRA and the associated regulations (40 CFR Sec. 268.31 - see page 40642 of the November 7, 1986 Federal Register), which prohibit the land disposal of listed dioxin wastes after November 8, 1988. Alternative 3 would also not comply with the RCRA standards for landfill design (see 40 CFR Part 264, Subpart N) which require a double-liner and double leachate collection systems. The containment system proposed in Alternative 3 for disposal of stored wastes, demolition debris and wastewater treatment sludge has no bottom liner and only a single leachate collection system.

Alternative 3, while more costly than Alternative 1 and 2, is less costly than the other alternatives considered. This would be the case even if it is assumed that the remedial alternatives involving containment would have to be periodically reconstructed to maintain their effectiveness. It can also be implemented quickly (construction would take approximately 2 years) and is without any anticipated implementation problems.

Alternative 4 - Excavation and On-Site Thermal Treatment of Waste

This alternative includes the excavation and on-site thermal treatment of all soils and site waste containing dioxin above 7ppb (Figures 5 and 9). This includes building rubble, contents of shipping containers, excavated soil and buried piling, and other miscellaneous site waste. Several tanks and major structural steel components from the on-site buildings would be cleaned and either disposed of off-site as non-hazardous waste or salvaged. Crushing/grinding would be required to reduce debris to a size suitable for treatment. A slurry wall would be installed prior to excavation. The thermally treated material would be placed back onto the site and a cap meeting RCRA requirements would be constructed over the treated material. A new bulkhead would be installed to increase the stability of the river bank and a monitoring program would be established and maintained during the post-implementation period. To implement this alternative, the fill and underlying sand unit would be dewatered and the resulting wastewater treated during remediation.

To clean the site to a 7 ppb dioxin level, most of the fill above the silt layer must be excavated. To dewater the excavation, the slurry wall would extend at least to the silt layer. The slurry wall may be required to extend to rock adjacent to the river to reduce inflow of ground water. The slurry wall would reduce the horizontal ground water flow into the excavation pit. However, because of the high potentiometric surface in the glacio-fluvial sand unit, especially adjacent to the Passaic River, the removal of the fill material, without adequate control, would be expected to cause disturbance (heave) of the silt layer. This phenomenon will affect the integrity of the silt layer which has been acting as a barrier against


DRAWING NUMBER 850032-B31
PROPERTY LINE AND FENCE
CAP
WATERPROOF SEAL
REINFORCED CONCRETE
FLOW ZONE
SYNTHETIC LINER
DRAINAGE TRENCH
YARD GRADE EL. 8.0
LINER AND FILTER FABRIC
SLURRY WALL
FIRE LANE
15.0'
APPROXIMATE EL. 14.5
SLOPE
DRAINAGE TRENCH
DRAIN WITH FLAP VALVE
100 YR. FLOOD EL. 10.2
MWL EL. 6.0
PASSAIC RIVER
LOW WATER EL. 0
CLAY
72,000
TREATED
C.Y.
MATERIAL
10'-0" ± EXCAVATION
7PPB LEVEL
FILL
SLURRY WALL
FILTER FABRIC AND CUSHION
SILT LAYER
EXISTING BULKHEAD
NEW BULKHEAD

NOTE:
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FIGURE 9

CONCEPTUAL CROSS SECTION
LOOKING EAST
ALTERNATIVE 4
80 LISTER AVENUE
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the downward migration of the dioxin. To control this phenomenon, the potentiometric head within the glacio-fluvial sand unit must be lowered below the level of the silt layer. This would require extensive dewatering of the sand unit and treatment of the pumped groundwater prior to discharge.

After excavation of the fill to the 7 ppb dioxin level, dioxin and DDT would still be present in the silt layer and ground water seeping into the sand unit would still contain these chemicals. The downward seepage would be similar to Alternative 2, although the mass of dioxin and DDT would be substantially less than Alternatives 2 because of the treatment of the fill layer.

The highest ranking method of thermal treatment indicated in the Feasibility Study is a mobile incinerator. Mobile thermal treatment systems have been used successfully to treat dioxin wastes, the most notable example being the use of the EPA mobile incinerator at the Denny Farm Superfund Site in Missouri. Pilot scale mobile thermal treatment systems developed by J.M. Huber Corp. and Shirco Infrared Systems, Inc. have also been successfully tested on small quantities of dioxin wastes. Larger versions of the Huber and Shirco mobile systems have been constructed but have not been tested on dioxin wastes. In addition, a number of other companies have developed mobile thermal treatment systems in the last few years. Although these systems have not been tested on dioxin wastes, most of these systems are potentially applicable to treating the type of waste found at the Diamond Shamrock Site. Because these mobile thermal treatment systems are newly developed, there is little data available on the performance of many of these units and on their reliability for extended periods of operation.

The EPA mobile incinerator is the largest mobile unit tested on dioxin waste and the only one which has burned dioxin waste over an extended period of time. The unit has demonstrated that it can achieve the required 99.9999% destruction and removal efficiency for dioxin. However, the unit experienced operating problems at Denny Farm which required that it be shut down for repair and maintenance more than half of the time. The EPA mobile incinerator was recently modified to correct past operating problems. However, the modified unit had not been used to burn dioxin wastes as of July 1987. Another trial burn at Denny Farm is planned for the modified unit.

The use of a single mobile incinerator like the EPA unit, operating at the rate achieved at Denny Farm (about 12 tons per day), would take about 20 years to burn the amount of waste present at the Diamond Shamrock Site. Although a number of these units could be constructed, brought to the site and operated simultaneously, there would be difficulty in locating a large number of small incinerators on a relatively small site. It also would not be cost effective to use small incinerators for a large project. Therefore, it would be preferable to use one or two larger thermal treatment units, although such units have not yet been tested on dioxin waste. Since one or more mobile thermal treatment unit may have to be designed, constructed, and tested prior to operation to clean up the Diamond Shamrock Site, it is expected to take at least six years to complete this remedy.

For thermal treatment to be considered fully successful, the treatment would need to be sufficient to allow delisting of the treated materials as hazardous wastes. If thermal treatment does not allow delisting of the treated waste, the treated waste may have to be managed in a more protective manner than described above.

After implementation of Alternative 4, the quantity of hazardous substances remaining at the site would be greatly reduced as a result of the thermal treatment of wastes. There would, however, be some remaining hazardous substances in the treated waste and in the silt layer. If necessary, more protective variations of Alternative 4 could be selected (e.g. adding a groundwater pumping and treatment system similar to the one described in Alternative 3, off-site disposal of the treated waste). Once Alternative 4, (with any more protective variations needed) has been implemented, further releases from the site would not significantly affect health or the environment. However, there would continue to be significant releases of hazardous substances during the period of time prior to the complete implementation of this remedy. The remedy will require an estimated six years to implement because of the need for a detailed incinerator design, a test burn, major excavation activities, the time required to treat more than 70,000 cubic yards of waste material, and the final disposition and capping of the treated materials. During the period of implementation the releases from the site will vary depending on the status of the remedial activities.

During the design phase there would be a continuation of the current releases from the site. During the excavation activities dusts and volatile chemicals would be released to the air. There would also be a discharge of treated groundwater resulting from groundwater pumping during the remedial activities. Lastly, there will be emissions from the incinerator stack.

Because the incinerator would be designed to achieve the RCRA standards for incinerators (see 40 CFR Part 264, Subpart O), the air emissions from the incinerator will contain very low concentrations of hazardous substances. For example, the standards require 99.9999 percent destruction and removal efficiency for dioxin. As a result, the air emissions from the incinerator would release less than 0.0001 lbs (0.05 g) of dioxin during the entire period of operation. Although a large population would be exposed to the incinerator emissions, the level of treatment required would provide adequate protection of health and the environment.

As previously discussed for Alternative 3, a high level of treatment can be provided for groundwater pumped from the site. While quantities of treated groundwater would be much greater during the implementation of Alternative 4 than for Alternative 3, proper design and the operation of the treatment facilities would provide adequate protection of the Passaic River.

The most significant releases expected from the implementation of Alternative 4 would be the air emissions resulting from the excavation activities. These emissions would result both from dust generation and from volatilization of chemicals exposed to air. A risk assessment performed by an EPA contractor for another site with high dioxin concentrations (Risks from Chemical Releases Associated with Proposed Excavation of the Hyde Park Landfill, Environ Corporation, November 1985), concluded that dioxin contaminated dusts generated from the proposed excavation would result in cancer risks greater than 10^{-2} at properties as far as 1200 meters from that site. While this assessment assumed conventional dust suppression methods, alternatives such as construction under an inflatable dome have not been demonstrated at hazardous waste sites. In the absence of new information, the remedial alternatives involving excavation of the fill layer cannot be determined to be adequately protective of health and the environment.

Alternative 4 requires minimal operation and maintenance once it has been implemented. The cap will need to be maintained and the site monitored.

Alternative 4 would, upon completion, comply with all applicable or relevant and appropriate requirements (ARARs) of State and Federal environmental laws.

Alternative 4, with a present value cost estimate of $46,600,000 is more costly than the alternatives based on on-site containment.

Alternative 5 - Excavation and Disposal of All Waste Above 7 ppb in a Secure On-Site Isolation Vault

This alternative includes the excavation of all soil containing dioxin above 7 ppb and disposing of this soil in an on-site, above grade vault (Figures 10 and 11).

The difficulties associated with excavation discussed for Alternative 4 apply to this alternative also. The vault would be constructed so that the bottom of the vault is one foot above the 100-year flood level (Elevation 10.2 feet). A lateral barrier (slurry wall) would be constructed along the site perimeter.

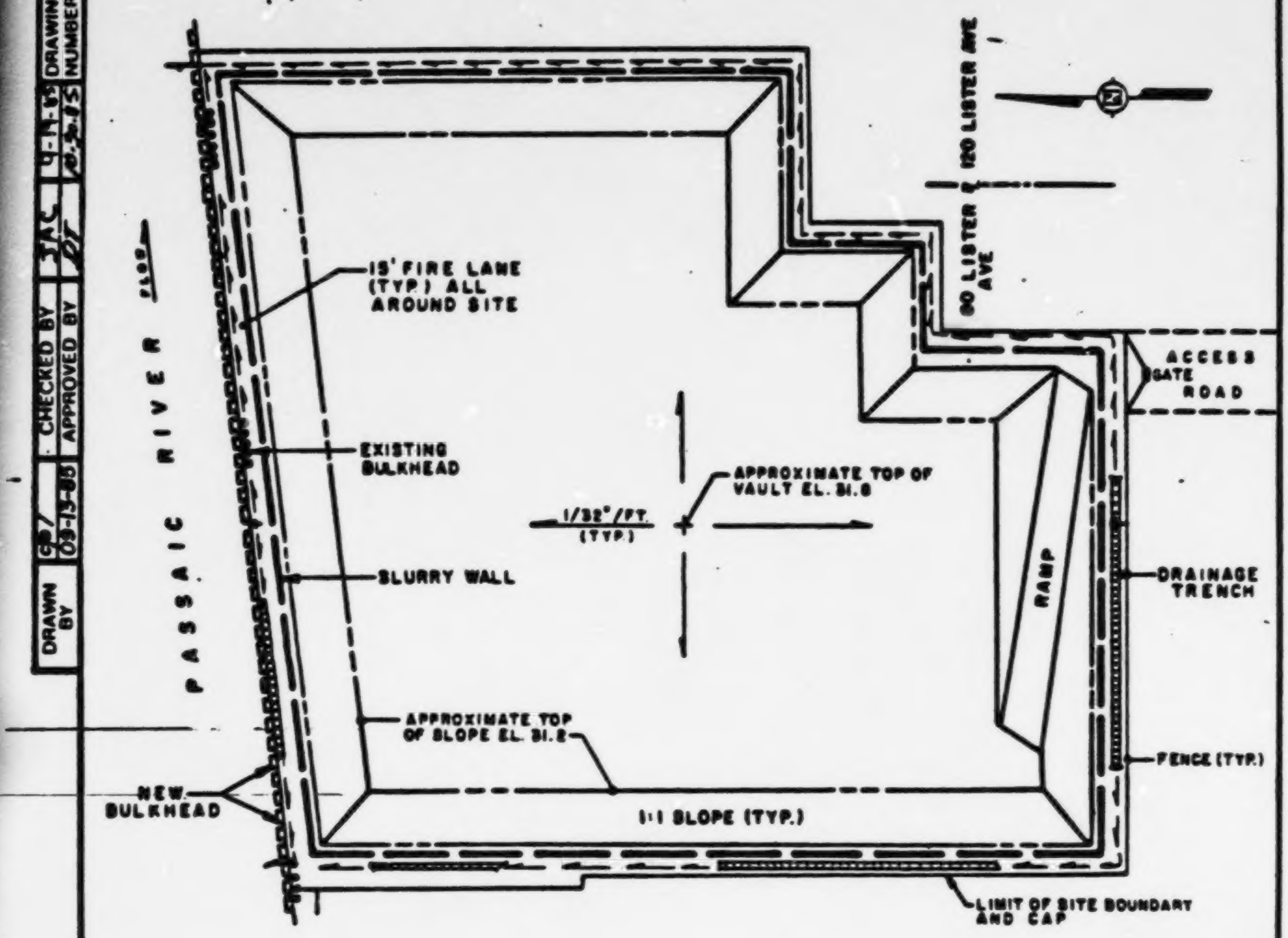
The construction of a slurry wall would be necessary to reduce the volume of water infiltrating during excavation and requiring treatment. In addition, the sand unit would be dewatered to reduce the piezometric pressures in the glaciofluvial sand to minimize potential disturbance of the silt layer.

On-site contaminated building demolition material, material stored in containers, and other site wastes would also be disposed of in the vault. Some tanks and major structural steel components would be decontaminated and either disposed of off-site as non-hazardous waste or salvaged. The vault would be lined (top, sides, and bottom) to meet RCRA requirements.

Clean fill would be purchased and placed in the excavation to return the excavated fill layer to existing ground surface. Because excavation would proceed to the 7 ppb level in the fill and dioxin is present in the silt layer, ground water seeping from the site will still contain dioxin, but at reduced levels from present conditions. The excavation, stockpiling, and backfilling would need to be finished before the vault could be complete; therefore, this alternative is extremely difficult, if at all feasible, due to the limited size of the site and the fact that the vault would be expected to cover most of the site.

To raise the vault above the 100-year flood elevation, an additional 4.5 feet of soil would be required above the existing grade. Coupled with the excavation backfilling, this represents the purchase and hauling of approximately 77,000 cubic yards of clean fill.

After implementation of Alternative 5, nearly all of the hazardous substances at the Site would be contained within the vault. However, some hazardous substances would remain in the silt layer. More protective variations of Alternative 5 could also be selected (e.g., adding a groundwater pumping and treatment system similar to the one described in Alternative 3). Portions of this remedy (e.g., the cap, landfill bottom liners, etc.) may gradually deteriorate with the passage of time. As discussed for Alternative 3, portions of the remedy such as the cap may need to be rebuilt or replaced periodically to maintain the effectiveness of this


PASSAIC RIVER
FLOW
15' FIRE LANE (TYP.) ALL AROUND SITE
EXISTING BULKHEAD
SLURRY WALL
APPROXIMATE TOP OF SLOPE EL. 31.2
NEW BULKHEAD
1/32"/FT. (TYP.)
APPROXIMATE TOP OF VAULT EL. 31.8
1:1 SLOPE (TYP.)
RAMP
LIMIT OF SITE BOUNDARY AND CAP
FENCE (TYP.)
DRAINAGE TRENCH
ACCESS ROAD
GATE
80 LISTER AVE
120 LISTER AVE
N

NOTE:
THIS PLAN IS CONCEPTUAL AND THE DETAILS OF THE DESIGN WILL BE FINALIZED PRIOR TO IMPLEMENTATION.

FIGURE 10

CONCEPTUAL SITE PLAN
ALTERNATIVE 5
80 LISTER AVENUE
PREPARED FOR

DIAMOND SHAMROCK
DALLAS, TEXAS

DRAWN BY	GD/ 09-13-85	CHECKED BY	JAC	4-11-85	DRAWING NUMBER	850032-A15
		APPROVED BY				

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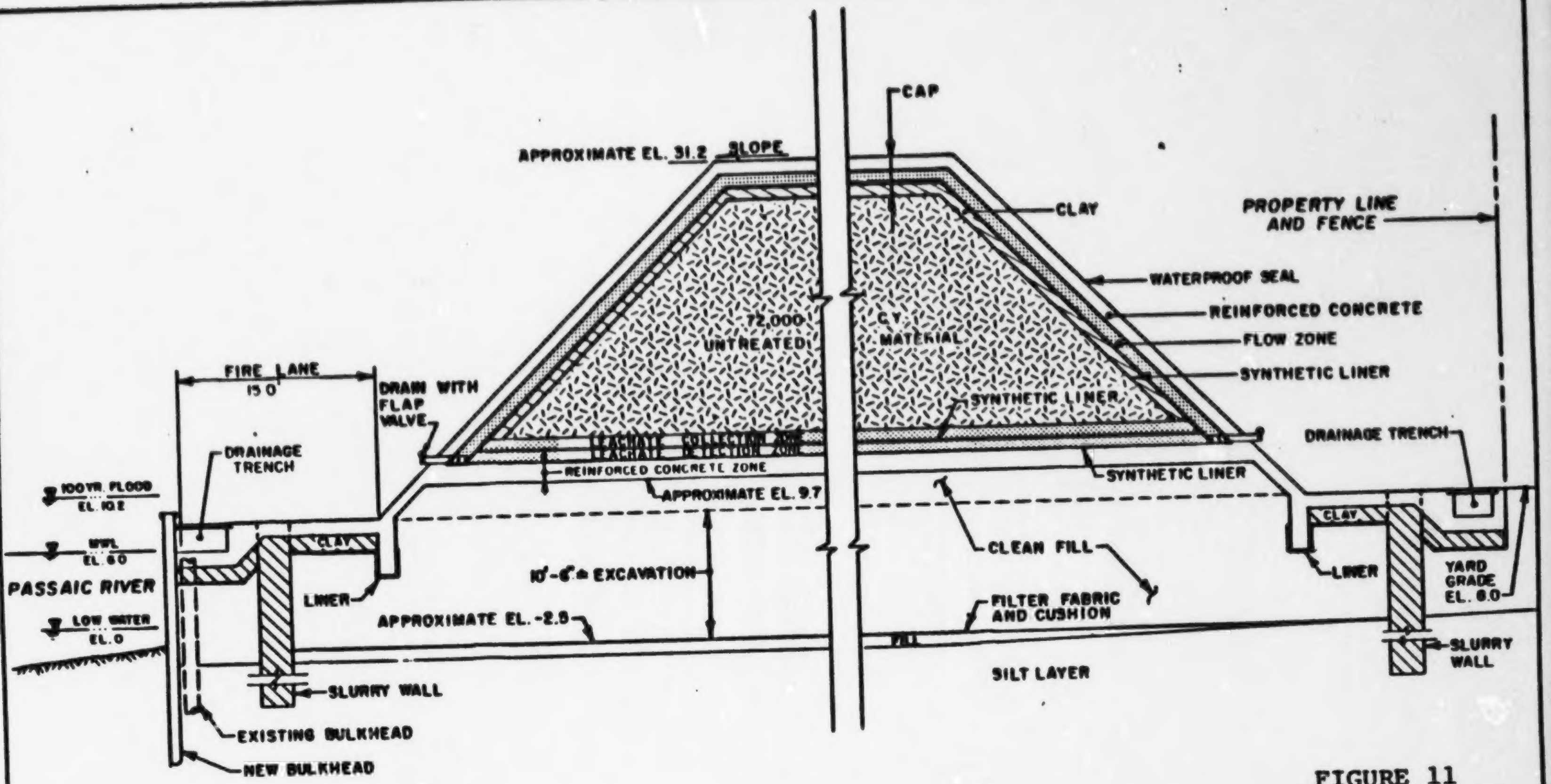
CAP
APPROXIMATE EL. 31.2 SLOPE
CLAY
PROPERTY LINE AND FENCE
WATERPROOF SEAL
REINFORCED CONCRETE
FLOW ZONE
SYNTHETIC LINER
72,000 C.Y. UNTREATED MATERIAL
SYNTHETIC LINER
LEACHATE COLLECTION ZONE
LEACHATE DETECTION ZONE
REINFORCED CONCRETE ZONE
APPROXIMATE EL. 9.7
SYNTHETIC LINER
DRAINAGE TRENCH
FIRE LANE
15.0'
DRAIN WITH FLAP VALVE
DRAINAGE TRENCH
100YR. FLOOD EL. 10.2
MWL EL. 6.0
PASSAIC RIVER
LOW WATER EL. 0
CLAY
LINER
10'-6" ± EXCAVATION
CLEAN FILL
APPROXIMATE EL. -2.5
FILTER FABRIC AND CUSHION
FILL
SILT LAYER
CLAY
LINER
YARD GRADE EL. 8.0
SLURRY WALL
SLURRY WALL
EXISTING BULKHEAD
NEW BULKHEAD

NOTE:
THIS CROSS SECTION IS CONCEPTUAL AND THE DETAILS OF THE DESIGN WILL BE FINALIZED PRIOR TO THE IMPLEMENTATION.

FIGURE 11
CONCEPTUAL CROSS SECTION
LOOKING EAST
ALTERNATIVE 5
80 LISTER AVENUE
PREPARED FOR
DIAMOND SHAMROCK
DALLAS, TEXAS

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remedy. Once Alternative 5 (with protective modifications as needed) has been implemented, further releases from the site would not significantly affect health or the environment, provided that the remedy is properly operated and maintained.

Similar to Alternative 4, there will be continued releases of hazardous substances during the period of remedy implementation. There would be continuation of current releases during the design phase. The period for design is likely to be lengthy considering the construction difficulties previously noted. These difficulties could be reduced if an off-site storage area can be found where the materials to be contained can be stored during excavation and vault construction. However, the siting of such a storage area may not be possible given the storage restriction of Section 3004(j) of RCRA in conjunction with the likelyhood of opposition from the community near any storage site.

Air emissions resulting from excavation activities would be similar to those described for Alternative 4, as would the discharge of treated ground water resulting from ground water pumping.

Alternative 5 will not rely primarily on treatment although some wastes would be stabilized prior to containment and leachate from the vault would be treated. Therefore, this alternative does not satisfy the treatment preference of CERCLA Section 121(b).

Alternative 5 will require continued operation and maintenance including the possible need to rebuild portions of the remedy should they deteriorate with time. Wastewater treatment needs for Alternative 5 would be less than Alternative 3 since there would be less infiltration of water into the contained volume.

Alternative 5 would not comply with the land disposal ban of RCRA Section 3004(e) and the implementing regulations (40 CFR Part 268, Subpart C - see page 40641 of the November 7, 1986, Federal Register).

Alternative 5, with a cost present value of $14,180,000 is the most costly of the on-site containment remedies but is less costly than the remedies which rely on thermal treatment.

Alternative 6 - Transport and Off-Site Disposal or Treatment

At present, permitted facilities do not currently exist which can accept RCRA regulated dioxin wastes from the site. However, permitted facilities may become available in the future.

The basic premise of Alternative 6 is that all materials containing dioxin levels above 7 ppb would be excavated and transported off-site. The shipping containers from 120 Lister Avenue would be shipped as is because they are presently sealed and the exteriors are not contaminated. Drummed wastes would be shipped as is, or in overpack drums for existing deteriorated drums. Building debris would be reduced to an adequate size for shipment and the excavated soils and subsurface debris would be shipped. The difficulties associated with excavation discussed for Alternative 4 apply to this alternative also. All shipments would be in sealed carriers.

The alternative also considers that the materials transported from the site would be disposed of by thermal treatment (eg. incineration) or by landfilling. Candidate sites for determining cost and transport method were selected on the basis of disposal or treatment facilities that would accept materials containing PCBs. A facility near Houston, Texas was identified for potential thermal treatment allowing transport by truck, rail, or barge. A landfill was identified near Emelle, Alabama which limits transport to trucking.

The cost for the landfilling or thermal treatment of dioxin-containing waste was assumed to be at least 30 percent greater than for PCBs. The actual cost is unknown.

Alternative 6A (Excavation with Off-site Disposal) is clearly not a viable alternative because it will be prohibited in the United States by the land disposal ban of Section 3004(e) of RCRA and the implementing regulations (40 CFR Part 268, Subpart C - see page 40641 of the November 7, 1986 Federal Register). 40 CFR Sec. 268.31 bans the land disposal of RCRA dioxin wastes after November 8, 1988. While CERCLA gives EPA the authority to waive applicable legal requirements at Superfund sites under certain conditions (see Section 121(d)(4) of CERCLA), CERCLA does not give EPA the authority to waive applicable requirements at off-site facilities. Efforts to locate treatment and disposal sites in other countries have, thus far, been unsuccessful. Therefore, Alternative 6A cannot be selected.

After the implementation of Alternative 6B (Excavation with Off-site Thermal Treatment), the quantity of hazardous substances remaining at the site would be greatly reduced. There would still be some remaining hazardous substances in the silt layer. If necessary, more protective variations of Alternative 6B could be selected (e.g. adding a groundwater pumping and treatment system similar to that described for Alternative 3). Once Alternative 6B (with any more protective variations needed) has been implemented, further releases from the site would not significantly affect health or the environment.

Compared to Alternative 4, Alternative 6B would have the advantage that a site could be selected with ample space to locate the thermal treatment equipment and with a buffer zone separting the facility from its neighbors. As in the case of Alternative 4, there would continue to be significant releases of hazardous substances during the time prior to the complete implementation of this remedy. Since at the present time there are no off-site incinerators of adequate capacity which are permitted for dioxin wastes and none with pending applications for permits, EPA must assume that one or more off-site incinerators would have to be designed, sited, permitted and constructed in order to implement this remedy. Because of potential siting problems, this remedy could take longer to implement than Alternative 4, which itself would take at least six years. Siting treatment disposal locations for waste from CERCLA cleanups has delayed cleanups in the past and would be expected to be especially difficult for a dioxin incinerator. With the exception of the fact that there would be no incinerator stack emissions at the site, the releases of hazardous substances at the site during implementation would be similar to Alternative 4.

Alternative 6B relies primarily on treatment and satisfies the preference for treatment of Section 121(b) of CERCLA.

Alternative 6B requires minimal operation and maintenance once it has been implemented. Continued monitoring would be required.

Alternative 6B would, upon completion, comply with all applicable or relevant and appropriate requirements (ARARs) of State and Federal environmental laws.

Alternative 6B is the most costly of all the alternatives with an estimated present value cost of $188,460,000.

Comparison Of Alternatives

As previously noted, Alternative 1 is not protective of health and the environment and Alternative 6A cannot be implemented given the RCRA land disposal ban and the lack of availability disposal facilities in other Countries. Therefore, these alternatives will not be considered further.

Alternative 2 and 3 are similar but Alternative 3 has several advantages over Alternative 2:

1. Alternative 2 would allow a continued, but reduced, release of contaminated ground water downward from the contained volume. Eventually, the quantity of ground water migrating downward would equal the quantity of water infiltrating the contained volume. For Alternative 3, the pumping of ground water from the contained volume would reverse the direction of ground water flow, causing an influx of ground water into the contained volume from the lower sand unit. This ground water flow reversal would provide additional protection of the ground water in the sand and bedrock below the site.

2. Alternative 3 is more reliable than Alternative 2 because the ground water pumping system provides a backup should the effectiveness of the slurry wall and cap be reduced with time. Therefore, the effectiveness of Alternative 3 can be maintained over time more readily than the effectiveness of Alternative 2.

3. The ground water pumping and treatment system of Alternative 3 will remove the more mobile hazardous substances from the contained volume and provide appropriate treatment. Since the remaining hazardous substances will be less mobile, the quality of the ground water in the contained volume should gradually improved with time. For Alternative 2, any improvement of ground water quality in the contained volume would be at the expense of the downward migration of mobile hazardous substances toward the deeper sand and bedrock aquifers, which are tapped by industrial water supply wells.

The advantages of Alternative 2 over Alternative 3 are that Alternative 2 would not result in a discharge of treated wastewater to the Passaic River and a relatively small difference in cost. However, by meeting the cleanup standards in Section VIII, the discharge of highly treated wastewater for Alternative 3 would be fully protective of the Passaic River.

Based on the above comparisons, Alternative 3 is preferred over Alternative 2.

As previously discussed, Alternatives 3, 4, 5, and 6B each would, after implementation, assure adequate protection of human health and the environment. However, Alternative 3 can be implemented much more quickly and would achieve its objectives much sooner than any of the other three alternatives. In addition, Alternatives 4, 5, and 6B each would involve extensive and difficult excavation activities expected to generate significant releases of hazardous substances to the air. The implementation of Alternative 3 would release a much smaller quantity of hazardous substances to the air during construction.

In the near term, it is clear that Alternative 3 presents less risk than Alternatives 4, 5, and 6B because it will bring the site under adequate control much more quickly than the other alternatives. In the long term, Alternatives 4 and 6B, which rely on thermal treatment to destroy hazardous substances, are more reliable than Alternatives 3 and 5 since once hazardous substances have been destroyed there is no further risk of their release.

However, the short term releases and exposures to hazardous substances resulting from the excavation of contaminated material associated with the implementation of Alternatives 4, 5, and 6B cannot be eliminated once they have occurred (i.e., once a person or the environment has been exposed to hazardous substances, it is impossible to go back in time and change this fact; irreparable harm may have been done). If Alternative 3 is implemented, short-term risk will be adequately controlled and it will still be possible to take future actions to control long-term risks. In fact, Section 121(c) of CERCLA requires that, if a remedial action that results in any hazardous substances remaining at the site is selected, such remedial action must be reviewed at least every five years to assure protection of human health and the environment. If at the time of review, further remedial action is appropriate in accordance with Section 104 or 106 of CERCLA, EPA must take or require such action. As noted previously, Alternative 3 would not fail suddenly, but may gradually become less effective with the passage of time. Therefore, the remedy could be reevaluated and supplemented by additional remedial action without appreciable damage resulting from loss of remedy effectiveness. In view of EPA's obligation to reevaluate containment remedies under Section 121(c) of CERCLA, Alternative 3 assures adequate long-term protection of health and the environment, as would Alternative 5 for the same reasons. Based on the currently available information, EPA has determined that Alternative 3 presents less risk at this time and is more protective than the other Alternatives when both short-term and long-term risks are considered.

Additional Considerations Regarding Alternative 3

For the reasons given in the previous section of this ROD, EPA has determined that Alternative 3 is more protective than the other Alternatives considered in the Feasibility Study. Before Alternative 3 can be selected, EPA must first take into account the factors listed in Section 121(b)(1) of CERCLA. As summarized below, EPA has taken these factors into account:

(A) The long-term uncertainties associated with land disposal -

As previously acknowledged in this ROD, it is expected that Alternative 3, which relies primarily on containment of hazardous substances, will require perpetual operation, maintenance, monitoring and reevaluation; and, if necessary, additional remedial action. EPA recognizes the need for continued care of the site and is obligated by Section 121(c) of CERCLA to ensure that the remedy remains protective in the long-term.

(B) The goals and requirements of RCRA -

As previously noted, Alternative 3 would not comply with the land disposal ban of Section 3004(e) of RCRA and the associated regulations, which prohibit the land disposal of listed dioxin wastes after November 8, 1988. Alternative 3 would also not comply with the RCRA standards for landfill design (see 40 CFR Part 264, Subpart N) which require a double-liner and double leachate collection systems.

Section 121(d)(4)(B) of CERCLA provides that EPA may select a remedy that does not comply with all applicable or relevant and appropriate requirements of Federal and State environmental law if compliance with all requirements will result in greater risk than alternative options. EPA has previously determined that Alternatives 4 and 6, which comply with the RCRA land disposal ban, will result in greater risk than Alternative 3 due to the potential exposure to hazardous substances resulting from excavation of contaminated material. Alternative 5, which would comply with RCRA landfill standards but not with the land disposal ban, would also result in greater risk than Alternative 3.

Variants of Alternative 3 are also possible which would contain the wastes presently in the ground in the same manner as Alternative 3, but utilize incineration or a double-lined on-site landfill to manage the wastes presently stored at the site as well as the demolition debris. The advantage of this approach is that a solution with greater long-term reliability can be used for some of the waste, without extensive excavation and the associated risks. This approach can also be more consistent with RCRA requirements than Alternative 3. However, these variants would offer no significant reduction in long-term risk compared to Alternative 3 because the wastes presently in the ground contain a much greater quantity of hazardous substances than the stored waste and demolition debris. Specifically, the material above ground contains relatively low concentrations of contaminants. Removing this material, while reducing the volume of waste, would remove only a small percentage of the mass of total contaminants. Therefore, the long term risk would remain essentially unchanged. These variants would also be more difficult and time consuming to implement than Alternative 3 (especially if incinerator siting, design and testing is involved) and would not bring the site under adequate control as expeditiously as Alternative 3. Therefore, Alternative 3 is preferable to these variants of Alternative 3.

Based on the above considerations, Alternative 3 may be selected although it will not comply with the RCRA land disposal ban or RCRA landfill design standards.

(C) The persistence, toxicity, mobility and propensities to bioaccumulate the hazardous substances and constituents -

The extreme toxicity and propensity to bioaccumulate and persistence of dioxin and other hazardous substance was taken into account in the remedy selection process. The fact that the hazardous substances would have greatly reduced mobility under the conditions which Alternative 3 would establish was also taken into account, as was the fact that excavation activities could greatly increase the mobility of hazardous substances such as dioxin, which would otherwise be relatively immobile.

(D) The short and long-term potential for adverse health effects from human exposure -

As previously discussed, Alternative 3 presents less potential for adverse health effects at this time than all other Alternatives considered when both short and long-term risks of exposure are considered. Specifically, the potential exposure to hazardous substances resulting from the excavation of contaminated material which is an essential component of Alternative 4, 5, 6A and 6B is determined to be too great a risk at this time.

(E) Long-term maintenance costs -

The long-term maintenance costs associated with Alternative 3 are recognized. The selection of Alternative 3 would be based on its greater protectiveness and not on its lower initial cost when compared to the other Alternatives.

(F) The potential for future remedial action costs if the alternative remedial action in question were to fail -

It is recognized that the performance of Alternative 3 could deteriorate with time and that costly additional remedial action may be necessary. However, the selection of Alternative 3 would be based on its greater protectiveness and not on its lower initial cost when compared to the other Alternatives.

(G) The potential threat to human health and the environment associated with excavation, transportation, and redisposal, or containment -

Future excavation, if required after implementation of Alternative 3, could have substantial risks. However, these risks would be no greater than the risks presented by the excavation activities associated with Alternatives 4, 5, and 6. As previously discussed, any deterioration of performances of Alternative 3 would be gradual and could be mitigated by additional response action when the initial sign of deterioration (such as an increased influx of ground water into the contained volume) is observed. The appropriate corrective action for remedy deterioration might be to rebuild the containment system rather than excavate. Rebuilding the containment system would involve far less risk of construction related releases than would actions involving excavation.

Section 121(b) of CERCLA creates a preference for remedies which utilize treatment by ensuring that the long-term disadvantages of remedial alternatives are taken into account in the remedy selection process. Since treatment alternatives tend to minimize long-term disadvantages, treatment is favored by taking these disadvantages into account. However, Section 121(b) also takes short-term risks into account. Section 121(b) is not intended to establish treatment as an end in itself, but to use treatment, to the extent practicable, as a means for ensuring protection of health and the environment. Since, for this site, the remedial alternatives which have a greater reliance on treatment are less protective than Alternative 3, Alternative 3 utilizes treatment technologies to the maximum extent practicable for achieving CERCLA's primary goal of protecting health and the environment.

VIII. Cleanup Standards

Section 121(d)(2) of CERCLA provides that EPA's remedial action, when conducted on-site, must comply with applicable or relevant and appropriate environmental standards established under Federal and State environmental laws except as provided by Section 121(d)(4). Such applicable or relevant and appropriate requirements sometimes will be referred to as ARARs. It is EPA's position is that on-site response actions need comply only with the substantive requirements of other environmental laws, not the procedural and administrative requirements of other environmental laws (e.g., requirements to obtain permits, prepare environmental impact statements, prepare planning documents, maintain records and submit reports). However, CERCLA actions will utilize procedural and administrative safeguards similar to those provided by other environmental laws. Since ARARs may not always provide an adequate level of protection (for example, there may not be an ARAR for a particular hazardous substance), cleanup standards may also be established based on risk assessment, guidance or other available information.

The five tables in this section list the ARARs and other cleanup standards which pertain to one or more remedial alternatives for the site. Table III lists Federal ARARs that will be attained by the selected alternative while Table IV lists the Federal ARARs that will not be attained by the selected alternative as well as Federal ARARs that are not pertinent to the selected remedy but are pertinent to other remedial alternatives. For each requirement, the tables provide a summary of the requirement, a description of the legal prerequisites which make the ARAR applicable and a legal citation which can be used to obtain further information on the ARAR. Unless otherwise specified by a footnote, each of the listed ARARs pertains to all the remedial alternatives. Footnotes are also provided to give site specific interpretations and other explanatory information. Tables V and VI provide similar information for State ARARs. However, States ARARs that do not pertain to the selected alternative (but may pertain to other alternatives) have not been included. Table VII lists other cleanup standards (e.g., those based on guidance or advisories, but not on promulgated legal requirements). In the event that there are several ARARs which pertain to the same hazardous substances, action or circumstance, the selected alternative must attain the most stringent of these ARARs, except as provided by Section 121(d)(4) of CERCLA.

It should be noted that the ARAR summaries provided in Tables III through VI are abbreviated versions of promulgated legal requirements. For a more complete understanding of these requirements, it is necessary to refer to the cited sources, which are too lengthy to reprint in this ROD in their entirety. It should also be noted that where administrative requirements (e.g., the need to obtain permits or submit planning documents) are listed in Tables III through VI, the substantive technical requirements of such permits or planning documents are ARARs. However, the administrative requirements themselves are not ARARs.

Except as provided by Section 121(d)(4) of CERCLA, ARARs must be attained upon completion of the remedial action as required by Section 121(d)(2). However, some ARARs are pertinent during the remedial action. For example, a newly installed ground water treatment facility, which could include tanks and a container storage area, generally should be designed and operated to

Table III

Federal ARARs That Will Be Attained By the Selected Alternative

Summary	Prerequisite	Citation	Footnotes
Facility must be designed, operated, and maintained to avoid washout.	RCRA hazardous waste: treatment, storage, or disposal within the 100 year flood plain	40 CFR 264.18(b)	1
Action to avoid adverse effects, minimize potential harm, restore and preserve natural and beneficial values.	Action will occur in a flood-plain, i.e., lowlands and flat areas adjoining inland and coastal waters and other flood prone areas	Executive Order 11988, Protection of Flood-plains, 40 CFR 6 App. A	2
Placement of a cap over waste (e.g., closing a land-fill, or closing a surface impoundment) requires a cover designed to: o Provide long term minimization of migration of liquids through the capped area; o Function with minimum maintenance; o Promote drainage and minimize erosion or abrasion of the cover; o Accomodate settling and subsidence so that the cover's integrity is maintained; and o Have a permeability less than or equal to the permeability of any bottom liner system or natural sub-soils present.	Hazardous waste land disposal unit capping	40 CFR 264.310(a)	3
Restrict post-closure use of the property as necessary to prevent damage to the cover.	Hazardous waste facility closure	40 CFR 264.117(c)	3

Summary	Prerequisite	Citation	Footnotes
Prevent run-on and run-off from damaging the cover	Hazardous waste landfill closure	40 CFR 264.310(b)	3
Protect and maintain surveyed benchmarks used to locate waste cells (landfills)		40 CFR 264.310(b)	3
Installation of final cover to provide long-term minimization of infiltration.		40 CFR 264.310	3
Post-closure care and groundwater monitoring.		40 CFR 264.310	3,4
Install two liners or more that prevent waste migration into the liner, and a bottom liner that prevents waste migration through the liner.	Hazardous waste currently being placed in a landfill	40 CFR 264.301	3
Install leachate collection systems above and between the liners.			
Construct run-on and run-off control systems capable of handling the peak discharge of a 25 year storm.			
Control wind dispersal of particulates.			
Prevent run-on and control and collect run-off from a 24-hour 25-year storm.		40 CFR 264.302	3
Inspect liners and covers during and after installation.		40 CFR 264.303	3
Inspect facility weekly and after storms to detect malfunction of control systems or the presence of liquids in the leachate collection and leak detection systems.			
Maintain records of the exact location, dimensions, and contents of each waste cell.		40 CFR 264.304	3

Summary	Prerequisite	Citation	Footnotes
Close each cell with a final cover after the last waste has been received.		40 CFR 264.310	3
No bulk or non-containerized hazardous waste containing free liquids may be disposed of in landfills.		40 CFR 264.314	3
Containers of hazardous waste must be:	Hazardous waste storage in containers		5
o Maintained in good condition;		40 CFR 264.171	
o Compatible with hazardous waste to be stored;		40 CFR 264.172	
o Closed during storage (except to add or remove waste);		40 CFR 264.173	
Inspect container storage areas weekly for deterioration.		40 CFR 264.174	
Place containers on a sloped, crackfree base, and protect from contact with accumulated liquid. Provide containment system with a capacity of 10% of the volume of containers of free liquids. Remove spilled or leaked waste in a timely manner to prevent overflow of the containment system.		40 CFR 264.175	5
Keep containers of ignitable or reactive waste at least 50 feet from the facilities property line.		40 CFR 264.176	5
Keep incompatible materials separate. Separate incompatible materials stored near each other by a dike or other barrier.		40 CFR 264.177	5

Summary	Prerequisite	Citation	Footnotes
At closure, remove all hazardous waste and residues from the containment system, and decontaminate or remove all containers, liners.		40 CFR 264.178	5
Prohibition on long-term storage of listed dioxin wastes	Storage after Nov. 8, 1988	40 CFR 268.50	5
Tanks must have sufficient shell strength (thickness), and, for closed tanks, pressure controls, to assure that they do not collapse or rupture.	Tanks	40 CFR 264.190	5
Waste must not be incompatible with the tank material unless the tank is protected by a liner or by other means.		40 CFR 264.191	5
Tanks must be provided with controls to prevent overfilling, and sufficient freeboard maintained in open tanks to prevent overtopping by wave action or precipitation.		40 CFR 264.194	5
Inspect the following: overfilling controls, control equipment, monitoring data, waste level (for uncovered tanks), tank condition, above-ground portion of tanks, and the areas surrounding tanks.		40 CFR 264.195	5
Repair any corrosion, crack or leak.		40 CFR 264.196	5
At closure, remove all hazardous waste and hazardous waste residues from tanks, discharge control equipment, and discharge confinement structures.		40 CFR 264.197	

Summary	**Prerequisite**	**Citation**	**Footnotes**
Compliance with effluent limitations requiring the application of best avalable technology (BAT) to control toxic and nonconventional pollutants and best conventional pollutant control technology (BCT) to control conventional pollutants.	Discharge of treatment system effluent to navigable waters (e.g. Passaic River)	40 CFR 122.44(a)	6,7
Compliance with water quality based effluent limitations.		40 CFR 122.44 (d)(2)	6,8
Discharge must be monitored to assure compliance. Discharge will monitor: o The mass of each pollutant o The volume of effluent o Frequency of discharge and other measurements as appropriate. Approved test methods for waste constituents to be monitored must be followed. Detailed requirements for analytical procedures and quality controls are provided.		40 CFR 122.44 (i)	6
Pollutants that pass through the POTW without treatment, interfere with POTW operation, or contaminate POTW sludge are prohibited. Specific prohibitions preclude the discharge of pollutants to POTWs that: o Create a fire or explosion hazard in the POTW; o Are corrosive (pH<5.0); o Are discharged at a flow rate and/or concentration that will result in interference; and	Discharge to publicly owned treatment works.	40 CFR 403.5	6,9

Summary	Prerequisite	Citation	Footnotes
o Increase the temperature of wastewater entering the treatment plant that would result in interference, but in no case raise the POTW influent temperature above 104 degree Fahrenheit (40 degree Celsius).			
o Discharge must comply with local POTW pretreatment program, including POTW-specific pollutant limitation spill prevention program requirements, and reporting and monitoring requirements.		40 CFR 403.5 and local POTW regulations	6,9

Table IV

Other Federal ARARs

Table IVA Federal ARARs For Incineration

Summary	Prerequisite	Citation	Footnotes
Analyze the waste feed.	Incineration of RCRA hazardous waste	40 CFR 264.341	10
Remove all hazardous waste and residues, including ash, scrubber water, and scrubber sludge upon closure.		40 CFR 264.351	10
Performance standards for incinerators:			
o Achieve a destruction and removal efficiency of 99.99% for each principal organic hazardous constituent in the waste feed and 99.9999% for dioxins; and		40 CFR 264.343	10
o Reduce hydrogen chloride emissions to 1.0 kg/hr or 1% of the HCl in the stack gases.		40 CFR 264.342	10
Monitoring of various parameters during operation of the incinerator is required. These parameters include:		40 CFR 264.343	10
o Combustion temperature;			
o Waste feed rate;			
o An indicator of combustion gas velocity; and			
o Carbon monoxide.			

Table IVB Federal ARARs That Will Not Be Attained By the Selected Alternative

Summary	Prerequisite	Citation	Footnotes
Treatment by Best Demonstrated Available Treatment before placement.	Placement after Nov. 8, 1988 of listed dioxin wastes	40 CFR 268 (Subpart D)	3
Prohibition on land disposal of listed dioxin wastes.		40 CFR 268 (Subpart C)	3

Footnotes for Tables III and IV

1. All alternatives require remedial action in a floodplain since the site is located within a floodplain. All alternatives except Alternative 1 can be designed to prevent washout.

2. All alternatives except Alternative 1 can be designed to minimize adverse effects from flooding. Alternative 2 through 6 would all significantly restore natural and beneficial values of the floodplain by reducing the risk of contact with hazardous substances. Changes in flooding patterns which would result from the U.S. Army Corps of Engineers flood control project for the upper Passaic River would also be factored into the remedial design.

3. This ARAR pertains to Alternatives 2, 3, 4 and 5 only.

4. The cited groundwater monitoring requirements do not pertain to this action. This action addresses only 80 and 120 Lister Avenue and is not intended to address off-site groundwater monitoring or restoration (see Section II, Scope of this Record of Decision).

5. This ARAR pertains to Alternatives 1, 3, 4, 5 and 6 only.

6. This ARAR pertains to Alternatives 3, 4, 5 and 6 only.

7. For the State of New Jersey, the authority to issue National Pollutant Discharge Elimination System permits, which contain technology-based effluent limitations, has been delegated by the Federal government to the State of New Jersey. This delegation was based on the finding that the State requirements for such permits are at least as stringent as the Federal requirements. Therefore, the attainment of the State effluent limitation ARARs of Table V will ensure compliance with the corresponding Federal requirements.

8. Water quality based effluent limitations are established by modeling the impact of the proposed discharge on the receiving water. While it is not within the scope of this ROD to clean up the existing contamination in the Passaic River or to abate other sources of pollution which are currently impacting the river, it is within the scope of this ROD to ensure that discharges from the site do not contribute to violations of state water quality standards or Federal Water Quality Criteria which are ARARs. Therefore, water quality standards are not ARARs for this ROD but water quality based effluent limitations are ARARs.

   Federal Water Quality Criteria were developed to assist States in establishing State water quality standards. While the criteria are not applicable requirements, Section 121(b)(2)(A) of CERCLA makes it clear that the Water Quality Criteria which are relevant and appropriate are ARARs. The Water Quality Criteria can be found in the Quality Criteria for Water 1986, USEPA, May 1, 1986. The criteria from this document which EPA considers relevant and appropriate to the Passaic River are:

a) The criteria for the protection of saltwater aquatic life.

b) The criteria for the protection of human health from exposure through ingestion of contaminated aquatic organisms (the Passaic River near the site is not a source of potable water but is a potential source of aquatic organisms for human consumption). For carcinogens, the criteria will be based on a level of protection corresponding to a 10^{-6} increased cancer risk.

The relevant and appropriate criteria for dioxin, DDT and hexachlorobenzene and the corresponding effluent limitation ARARs are:

Pollutant	Criterion	Effluent Limitation ARAR
Dioxin	1.4×10^{-5} ng/L	1.0×10^{-8} lbs/day
DDT	2.4×10^{-2} ng/L	1.6×10^{-5} lbs/day
Hexachlorobenzene	7.4×10^{-1} ng/L	5.4×10^{-4} lbs/day

These effluent limitations were calculated using the formula

$$EL = Q \times 8.33 \times 10^{-6} \times C$$

where EL is the effluent limitation in lbs/day, C is the water quality criterion in ng/L and Q is the flow of the Passaic River in million gallons per day.

This formula is based on a number of assumptions:

- Steady state behavior
- Conservative behavior of substances (e.g. no biodegradation, volatilization, etc.)
- Complete mixing
- Background concentrations are zero

The flow of the Passaic River used for the calculations is 89 million gallons per day, which is the seven day average low flow expected once in ten years (the 7Q10 flow). While a number of conservative assumptions (e.g. use of the 7Q10 flow, assumption that substances behave conservatively) were made which result in the calculated limitations being more protective, the assumption of zero background concentrations is not a conservative assumption. Although dioxin has not been found in Passaic River water samples taken near the site, the water quality criterion for dioxin is below the current detection limit. Therefore, there may be non-zero background concentrations of dioxin which have not been detected due to analytical limitations. Improved analytical methods are becoming available which may succeed in measuring very low concentrations of dioxin in Passaic River water. The presence of dioxin, DDT and hexachlorobenzene in Passaic River water will be studied further and the effluent limitation ARARs may be reconsidered based on new data that becomes available.

Effluent limitations based on the Federal Water Quality Criteria for pollutants other than dioxin, DDT and hexachlorobenzene are less stringent than the State effluent limitation ARARs in Table V.

9. An option for Alternatives 3 through 6 is to discharge the treated wastewater to the Passaic Valley Sewerage Commision (PVSC) treatment plant instead of direct discharge to the river. The viability of this option will depend on the PVSC's willingness to accept this discharge for treatment.

   The PVSC's Rules and Regulations Concerning Discharges to the Passaic Valley Sewerage Commisioners Treatment Works contains applicable Federal ARARs since these rules and regulations were developed pursuant to the requirements of the Federal Clean Water Act. These rules and regulations are available for review in the administrative record. In addition, the Federal pretreatment program has been delegated to the State of New Jersey based on the finding that the State program requirements are at least as stringent as the Federal requirements. Therefore, the attainment of the State pretreatment ARARs in Table V will also ensure that the corresponding Federal pretreatment requirements are attained.

   The PVSC treatment plant is designed to treat conventional pollutants as well certain as toxic and non-conventional pollutants. For dioxin, DDT, and hexachlorobenzene, which are not specifically addressed by the PVSC rules and regulations, the direct discharge water quality criteria based effluent limitations will be considered relevant and appropriate to the pretreated effluent.

10. This ARAR pertains to Alternatives IV and VIB only.

Table V

New Jersey State ARARs That Will Be Attained By the Selected Alternative

Requirement Summary	Prerequisite/Application	Regulatory Citation	Footnote
A facility located in the 100 year floodplain must be designed, operated and maintained to prevent washout of any hazardous waste unless the owner or operator can show that the waste can be removed safely, before floodwaters reach the facility.	Location Standards for New Hazardous Waste Facilities - Construction Within the 100 year floodplain	7:26-10.3(a)1	1,2,3
Container storage areas must have a containment system that is capable of collecting and holding spills, leaks, and precipitation.	Use and Management of Containers	7:26-10.4(b)1 et. seq.	2,3
All hazardous waste and hazardous waste residues must be removed from the containment system at closure.		7:26-10.4(c)1	
Unless the owner or operator can demonstrate that the solid waste removed from the containment system at closure is not a hazardous waste, the owner or operator becomes a generator of hazardous waste.		7:26-10.4(c)2	
Tanks shall have sufficient shell strength and, for closed tanks, pressure controls to ensure that they do not rupture or collapse.	Tanks	7:26-10.5(b) et. seq.	2,3
General operating requirements for tanks include the following: o Wastes and other material that are incompatible with tank material shall not be placed in the tank. o The owner or operator shall use appropriate controls to prevent overfilling.		7:26-10.5(c) et. seq.	

Requirement Summary	Prerequisite/Application	Regulatory Citation	Footnote
Above ground storage tanks must have a containment system comparable to containment systems for containers.		7:26-10.5(d)1 et. seq.	
The owner or operator shall inspect overfilling control equipment, data gathered from monitoring devices, monitoring equipment, tank construction materials, and the general condition of areas surrounding tanks at least once a day.		7:26-10.5(e)1 et. seq.	
At closure, remove all hazardous waste from tanks, discharge control equipment, and discharge confinement structures.		7:26-10.5(e)6(h)1	
Repair any leak, crack or wall thinning.		7:26-10.5(e)4	
A groundwater monitoring system shall be established to prevent the contamination of groundwater.	Hazardous Waste Landfills	7:26-10.8(e) et. seq.	2,3
Cover or otherwise manage the hazardous waste landfill so that wind dispersal of hazardous waste is eliminated.		7:26-10.8(e) et. seq.	
Ignitable, corrosive and reactive waste shall not be placed in a hazardous waste landfill unless the waste is first treated to render it nonignitable, noncorrosive and/or nonreactive.		7:26-10.8(e)8	
Incompatible wastes shall not be placed in the same cell of a hazardous waste landfill.		7:26-10.8(e)9	
Bulk liquids, non-containerized liquids, wastes containing free liquids and acute hazardous waste shall not be placed in a hazardous waste landfill.		7:26-10.8(e)10	
Liquid waste of small quantity may be placed in a hazardous waste landfill.		7:26-10.8(e)11	
All empty containers shall be crushed flat, shredded or reduced in volume prior to disposal.		7:26-10.8(e)12	

Requirement Summary	Prerequisite/Application	Regulatory Citation	Footnote
No odors shall be detectable off-site.		7:26-10.8(e)17	
Liquid wastes mixed with absorbent material may be placed in a hazardous waste landfill.		7:26-10.8(e)20	
The owner or operator of a hazardous waste landfill shall supply: a map showing the locations, dimensions, and depth of each cell, contents of each cell, and the approximate locations of each hazardous waste in each cell.		7:26-10.8(f) et. seq.	
Liners and final covers shall be inspected for uniformity, damages, etc..		7:26-10.8(h) et. seq.	
The owner or operator shall close the hazardous waste facility in a manner that minimizes further maintenance and controls.	General Closure Requirements	7:26-9.8(b)	2,3
The owner or operator shall have a written closure plan.		7:26-9.8(c)	
The closure plan shall identify the steps necessary to close the facility.		7:26-9.8(e) et. seq.	
At final closure of a hazardous waste landfill or any cell therein, the owner or operator shall place final cover to provide longterm minimization of migration of liquids into the landfill.	Specific Closure Requirements	7:26-10.8(i) et. seq.	2,3
The final cover shall:		7:26-10.8(i)2	
o consist of a vegegative top cover			
o consist of a drainage layer			
o consist of a liner system			
o accomodate settling			

Requirement Summary	Prerequisite/Application	Regulatory Citation	Footnote
The owner or operator shall consider as part of closure at least the following: o the type and amount of waste o the mobility of the waste constituents o site location, topography, and surrounding land use o Climate o Characteristics of cover material o Geologic and soils profiles o Surface and subsurface hydrology		7:26-10.8(i)4	
Post closure care shall continue for 30 years after the date of completing the closure.	General Post Closure Requirements	7:26-9.9(a) et seq.	2,3
A owner or operator must establish financial assurance.	Financial Requirements for Facility Post Closure Care.	7:26-9.11(a) et seq.	2,3
Maintain the function of the final cover, continue to operate the leachate collection system, maintain and monitor the leak detection system, prevent run-on and run-off, maintain gas collection system, maintain and monitor groundwater monitoring system, protect and maintain benchmarks, restrict access.	Specific Post Closure Requirements	7:26-10.8(i)5 et seq.	2,3

Requirement Summary	Prerequisite/Application	Regulatory Citation	Footnote
Permits to construct and certificate to operate required for new or altered air pollution control appuratus and equipment.	New or Altered Air Pollution Control Devices	7:27-8 et. seq.	4,5
Requirements for the storage, transfer and use of toxic volatile organic substances.	Use of Listed Toxic Substances	7:27-17 et. seq. 7:27-16 et. seq.	
Requirements for toxic substance emissions from control apparatus.	Discharge of Toxic Volatile Organic Substances	7:27-17 et.seq.	
Toxic Volatile Organic Compounds must be discharged from a point source at least 40 feet above grade and at least 20 feet higher than the nearest human use occupancy.		7:27-17.4 et. seq.	
A permit shall be obtained for the construction or alteration of any structure or permanent fill along, in, or across the channel or flood plain of any stream.	Construction Within a Flood Plain	7:8-3.15	6,7
A permit must be obtained prior to the development of waterfront upon any navigable waterway. Waterfront development means docks, wharves, piers, bulkheads, bridges, pipelines and dredging operations.			8
Those persons who presently discharge or plan to discharge to the surface waters of the State must apply for a NJPDES permit which grants approval for such discharge. Permittees currently holding a Federal NPDES permit are exempt but must apply for a State NJPDES permit within six months of expiration.	Discharge to Surface Water	7:14A-1 et. seq.	9,10,11,12

Requirement Summary	Prerequisite/Application	Regulatory Citation	Footnote
Persons who plan to discharge to surface waters of the state must first appy for and receive a discharge allocation certificate which allocates the effluent limitations that the facility must meet initially.		7:14A-2.1(f)	
Those persons who presently discharge or plan to discharge to the land or groundwater of the state must apply for a NJPDES permit which grants approval.	Discharge to Land/ Groundwater	7:14A-1 et. seq.	13,14
Persons diverting more than 100,000 gallons of water per day (70 gpm) from surface or groundwaters shall obtain a water supply allocation permit.	Water Diversion	7:19 et. seq.	15,16
Certain sewer systems are prohibited from accepting new tie-ins to sewer lines.	Sewerage Facility Tie-ins	7:9-13.1 et seq.	17
Permits must be obtained for the drilling, boring, coring or excavation of any well. All abandoned wells must be sealed.	Well Drilling and Sealing	7:8-3.11	18
Owners or operators of new and existing major facilities and cleanup organizations must file with the NJDEP. Major facilities include but are not limited to any appurtenance that is used or capable of being used to refine, produce, store, handle, transfer, process or transport petroleum or other hazardous substances.	Storage and Transfer of Petroleum and Other Hazardous Substances	7:1E et seq.	19

Footnotes for Table V

1. All New Jersey State ARARs are for the selected alternative only. In some cases, administrative requirements, such as permitting requirements are cited above. Although these are not considered ARARs, the technical requirements associated with the permits are. For additional specific requirements, the reader is refered to the regulations cited below.

2. Statutory citation: N.J.S.A. 13:1E-1 et seq.. Also known as the Solid Waste Management Act.

3. Additional specific requirements may be found at N.J.A.C. 7:26-1 et seq.

4. Statutory citation: N.J.S.A. 26:2C-9.2 et seq.. Also known as the Air Pollution Control Act.

5. Additional specific requirements may be found at N.J.A.C. 7:27 et. seq.

6. Statutory citation: N.J.S.A. 58:16A-50 et seq.. Also known as the Flood Hazard Area Control Act.

7. Additional specific requirements may be found at N.J.A.C. 7:8-3.5.

8. Statutory Citation: ~~N.J.S.A. 12:5-3.~~

9. Statutory Citation: N.J.S.A. 58:10A-1 et seq.. Also known as the New Jersey Water Pollution Control Act.

10. Additional specific requirements may be found at N.J.A.C. 7:14A-1 et seq.

11. NJPDES Toxic Effluent Limitations for discharge to the surface waters of the State of New Jersey - N.J.A.C. 7:14A-1 et. seq., Appendix F. These limitations are promulgated regulations for the discharge of toxic substances to surface water. The regulation outlines the criteria for developing the chemical specific limitations listed below. These limitations are therefore applicable. Where two numbers appear in the column, the limitation on the left indicates a maximum weekly limitation, with the number on the right indicating a monthly limitation.

BASE/NEUTRAL-ACID EXTRACTABLES	NJPDES Toxic Effluent Limitation (ug/l)
2,4,6-Trichlorophenol	115/260
2-Chlorophenol	35/125
2,4-Dichlorophenol	23/150
Phenol	17/40

BASE/NEUTRAL-ACID EXTRACTABLES continued	NJPDES Toxic Effluent Limitation (ug/l)
Benzoic Acid	
2-Methylphenol	
4-Methylphenol	
2,4,5-Trichlorophenol	
Acenaphthene	
1,2,4-Trichlorobenzene	45/90
Hexachlorobenzene	20/40
2-Chloronaphthalene	
1,2-Dichlorobenzene	40/110
1,3-Dichlorobenzene	25/35
1,4-Dichlorobenzene	18/45
Fluoranthene	16
Naphthalene	35/105
Bis(2-ethylhexyl)phthalate	
Di-N-butylphthalate	
Benzo(a)anthracene	
Anthracene	
Fluorene	
Phenanthrene	35/105
Pyrene	
Benzyl alcohol	
2-Methylnaphthalene	
VOLATILE ORGANICS	
Benzene	21/57
Chlorobenzene	23/45
1,2-Dichloroethane	30/85
1,1,1-Trichloroethane	25/65
1,1-Dichloroethane	25/65
Chloroform	20/40
1,1-Dichloroethene	
trans-1,2-Dichlorethene	25/65
Ethylbenzene	430
Methylene Chloride	
Tetrachloroethene	
Toluene	18/35
Trichloroethene	25/65
Vinyl Chloride	25/65
Acetone	
2-Butanone	
Carbon Disulfide	
4-Methyl-2-pentanone	
Total xylenes	

HERBICIDES, PESTICIDES, AND PCBs	NJPDES Toxic Effluent Limitation (ug/l)
4,4-DDT	0.001
4,4-DDE	14.0
4,4-DDD	
Alpha-endosulfan	32/90
2,4-D	1500/3300
2,4,5-T	
2,4-DB	14/25
Dinoseb (DNBP)	420/790
2,3,7,8-TCDD	BMDL *
INORGANIC PARAMETERS	
Antimony	200/305
Arsenic	50/115
Beryllium	5.3
Cadmium	0.012
Chromium	44 tri 0.29 hex
Copper	4.0
Lead	0.75
Mercury	0.00057
Nickel	7.1
Selinium	
Silver	0.12
Zinc	47
Total Cyanide	3.5
Total Phenol	
Nitrate Nitrogen	
OTHER PARAMETERS	
Total Organic Carbon (TOC)	/40,000
Total Suspended Solids	30,000/50,000
pH (standard units)	6-9
Petroleum Hydrocarbons	10,000/15,000
Total Toxic Organics	
Total Volatile Organics	
Total Dissolved Solids	
Suspended Particulates	

* BMDL means below minimum detection limit. Minimum detection limit for 2,3,7,8-TCDD as defined by 40 CFR 136 is 0.002 ppb.

12. Treatment of Wastewaters - NJAC 7:14A-1 et seq., defines limitations for discharges of toxic substances to surface waters. In some cases, limitations of individual compounds are based on and similiar to NJPDES Toxic Effluent Limitations (see reference(11)). Other limitations are derived based on National Categorical Pretreatment Standards

(40 CFR 413, 415, and 433), as required by the Clean Water Act of 1977. Development of some chemical class limitations are derived from Pesticide Chemicals Point Source Pretreatment Standards and Best Available Technology (BAT), which are considered appropriate and relevant.

BASE/NEUTRAL-ACID EXTRACTABLE COMPOUND	Treatment of waste water limitation (ug/l)
2,4,6-Trichlorophenol	23/50
2-Chlorophenol	23/50
2,4-Dichlorophenol	23/50
Phenol	17/40
Benzoic Acid	
2-Methylphenol	
4-Methylphenol	
2,4,5-Trichlorophenol	23/50
Acenaphthene	
1,2,4-Trichlorobenzene	55/130
Hexachlorobenzene	+
2-Chloronaphthalene	
1,2-Dichlorobenzene	40/110
1,3-Dichlorobenzene	+
1,4-Dichlorobenzene	18/45
Fluoranthene	
Naphthalene	
Bis(2-ethylhexyl)phthalate	
Di-N-butylphthalate	
Benzo(a)anthracene	
Anthracene	
Fluorene	
Phenanthrene	
Pyrene	
Benzyl alcohol	
2-Methylnaphthalene	

VOLATILE ORGANICS	
Benzene	21/57
Chlorobenzene	23/57
1,2-Dichloroethane	400/1000
1,1,1-Trichloroethane	+
1,1-Dichloroethane	+
Chloroform	32/75
1,1-Dichloroethene	
trans-1,2-Dichlorethene	+
Ethylbenzene	+
Methylene Chloride	160/560
Tetrachloroethene	
Toluene	18/35
Trichloroethene	+
Vinyl Chloride	+
Acetone	-

2-Butanone	
Carbon Disulfide	
4-Methyl-2-pentanone	
Total xylenes	

HERBICIDES, PESTICIDES, AND PCBS

4,4-DDT	0.012 ++
4,4-DDE	0.004 ++
4,4-DDD	0.0011 ++
Alpha-endosulfan	32/90
2,4-D	1500/3300
2,4,5-T	790/1900
2,4-DB	14/25
Dinoseb (DNBP)	420/790
2,3,7,8-TCDD	0.002 ++

INORGANIC PARAMETERS

Antimony	
Arsenic	1000/3000
Beryllium	
Cadmium	260/690
Chromium	120/230
Copper	360/1100
Lead	400/600
Mercury	48/110
Nickel	170/360
Selinium	
Silver	
Zinc	660/2200
Total Cyanide	
Total Phenol	
Nitrate Nitrogen	

OTHER PARAMETERS

Total Organic Carbon (TOC)	
Total Suspended Solids	
pH (standard units)	6-9
Petroleum Hydrocarbons	100,000/150,000
Total Toxic Organics	2,130/2,130
Total Volatile Organics	+++
Total Dissolved Solids	
Suspended Particulates	

+ concentrations noted to be in TTO limitation.

++ minimum detection limit as defined by 40 CFR 136.

+++ toxic volatile organic substances. Mass limit shall be 0.1 lb/hr for individual compounds and 0.5 lb/hr for the sum total.

13. Statutory Citation: N.J.S.A. 58:10A-1 *et seq*.. Also known as the New Jersey Water Pollution Control Act.

14. Additional specific requirements may be found at N.J.A.C. 7:14A-1 et seq..

15. Statutory citation: N.J.S.A. 58A:1 et seq.. Also known as the Water Supply Management Act.

16. Additional specific requirements may be found at N.J.A.C. 7:19 et seq..

17. Statutory citation: N.J.S.A. 58:10A-1 et seq.. Also known as the Water and Sewer Laws.

18. Statutory citation: N.J.S.A. 58:4A-14. Also known as the Well Drilling and Pump Installers Licensing Act.

19. Statutory citation: N.J.S.A. 58:10-23.11 et al.. Also known as the Spill Compensation and Control Act.

Table VI

New Jersey State ARARs That Will Not Be Attained By the Selected Alternative

Requirement Summary	Prerequisite/Application	Regulatory Citation	Footnote
A landfill that is used for the disposal of hazardous waste shall have a liner system designed to prevent any migration of wastes out of the landfill.	Hazardous Waste Landfills	7:26-10.8(c) et. seq.	1
Landfills used for the disposal hazardous waste shall have a leachate collection system.		7:26-10.8(d) et. seq.	2
No waste disposal shall occur within 200 feet of the property boundary.			3

Footnotes for Table VI

1. Statutory citation: N.J.S.A. 13:1E-1 et. seq.(Also known as the Solid Waste Management Act). Additional information regarding the requirements for hazardous waste landfills may be found at N.J.A.C. 7:26-1 et. seq.. Since the Solid Waste Management Act encompassess the requirements set by the Federal Resource Conservation and Recovery Act (RCRA), Federal RCRA ARARs that are waived will have state equivalents that will also be waived.

2. Although leachate will be collected as a result of pumping and treating groundwater within the proposed sluury wall, the leachate collection system will not attain the minimum RCRA requirements including a leachate collection system above and between liners.

3. Buffer zone is a state ARAR which will be waived since the site conditions, i.e., size, does not allow 200 feet of setback.

Table VII

Other Cleanup Standards

BASE/NEUTRAL-ACID EXTRACTABLES	Health Advisories(1) (ppb)	Soil Cleanup(3) (ppb)
2,4,6-Trichlorophenol		
2-Chlorophenol		
2,4-Dichlorophenol		
Phenol		
Benzoic Acid		
2-Methylphenol		
4-Methylphenol		
2,4,5-Trichlorophenol		
Acenaphthene		
1,2,4-Trichlorobenzene		10,000
Hexachlorobenzene		10,000
2-Chloronaphthalene		10,000
1,2-Dichlorobenzene		10,000
1,3-Dichlorobenzene		10,000
1,4-Dichlorobenzene		10,000
Fluoranthene		10,000
Naphthalene		10,000
Bis(2-ethylhexyl)phthalate		10,000
Di-N-butylphthalate		10,000
Benzo(a)anthracene		10,000
Anthracene		10,000
Fluorene		10,000
Phenanthrene		10,000
Pyrene		10,000
Benzyl alcohol		10,000
2-Methylnaphthalene		10,000
VOLATILE ORGANICS		
Benzene		1,000
Chlorobenzene		1,000
1,2-Dichloroethane		1,000
1,1,1-Trichloroethane		1,000
1,1-Dichloroethane		1,000
Chloroform		1,000
1,1-Dichloroethene		
trans-1,2-Dichlorethene		1,000
Ethylbenzene		1,000
Methylene Chloride		1,000
Tetrachloroethene		
Toluene		1,000
Trichloroethene		1,000
Vinyl Chloride		1,000
Acetone		1,000

VOLATILE ORGANICS continued	Health Advisories(1) (ppb)	Soil Cleanup(2) (ppb)
2-Butanone		1,000
Carbon Disulfide		1,000
4-Methyl-2-pentanone		1,000
Total xylenes		1,000
HERBICIDES, PESTICIDES, AND PCBs		
4,4-DDT		
4,4-DDE		
4,4-DDD		
Alpha-endosulfan		
2,4-D		
2,4,5-T		
2,4-DB		
Dinoseb (DNBP)		
2,3,7,8-TCDD	1.0	
INORGANIC PARAMETERS		
Antimony		
Arsenic		20,000
Beryllium		
Cadmium		3,000
Chromium		100,000
Copper		170,000
Lead		400,000
Mercury		1,000
Nickel		100,000
Selinium		4,000
Silver		5,000
Zinc		350,000
Total Cyanide		12,000
Total Phenol		
Nitrate Nitrogen		
OTHER PARAMETERS		
Total Organic Carbon (TOC)		
Total Suspended Solids		
Petroleum Hydrocarbons		100,000
Total Toxic Organics		
Total Volatile Organics		1,000

Footnotes for Table VII

1. Health Advisories - Guidance received from appropriate health agencies such as the Center for Disease Control (CDC) and the New Jersey Department of Health (NJDOH). Considered as other guidance to be employed in the implementation of the selected alternative.

   The concentration of 1.0 ppb of dioxin is a soil concentration that was developed by the CDC and has been applied consistently at cleanups throughout New Jersey.

   A risk based 2,3,7,8-TCDD concentration of 500 nanograms per square meter has been developed by the NJDEP to be employed during cleanup of surfaces contaminated with dioxin. (e.g., trucks, backhoes, etc.). This concentration of dioxin has been employed in the past to assess the performance of decontamination procedures.

2. Soil Cleanup Standards - These standards are not yet promulgated, but have been accepted and used by the NJDEP. They are therefore presented here for consideration as appropriate and relevant requirements.

   The concentration noted in each organic category are for each compound individually or the total sum concentration of that class of compound, e.g., the total concentration of base neutral compounds cannot exceed 10,000 ppb. Inorganic concentrations are for individual elements. Concentrations given are based on best professional judgement, risk assessment, best available technology (detection limits), or known average background concentrations.

meet the ARARs for tanks, containers and effluent quality during the remedial action. As a general rule, the remedial action should not result in any new instances of non-attainment of ARARs, except as provided by Section 121(d)(4). In contrast, instances of non-attainment of ARARs which exist prior to the commencement of remedial action generally cannot be corrected until the remedial action (or a portion of the remedial action) has been completed. The timing of the attainment of ARARs listed in Tables III and V will be in accordance with the above principles.

The selected remedial alternative described in Section IX of this ROD will be designed to meet all pertinent ARARs and other cleanup standards except those listed in Table IVB and VI:

- The RCRA land disposal ban
- The RCRA standards for landfill design
- The New Jersey Solid Waste Management Act requirements for landfill design, requiring a liner system and a 200 foot buffer zone

For the reasons given in item (B) under Additional Considerations Concerning Alternative 3 in Section VII of this ROD, Section 121(d)(4)(B) of CERCLA allows the selection of the chosen remedy despite the fact that it does not comply with the RCRA land disposal ban or landfill design standards. Similarly, Section 121(d)(4)(B) also allows for selection of the chosen alternative despite the fact that it does not comply with the New Jersey Solid Waste Management Act requirements for landfill design. In addition, the 200 foot buffer zone requirement (no disposal within 200 feet of the property line) is technically impracticable given the site dimensions and would provide no significant added protection given the presence of hazardous substances already in the ground near the property line. These circumstances allow for the selection of the chosen alternative pursuant to Sections 121 (d)(4)(C) and (D) despite the fact that it will not comply with the buffer zone requirement.

IX. Description of the Selected Alternative

The evaluation of remedial alternatives presented in Section VIII of this document determined that Alternative 3 is the most protective of the alternatives considered in the Feasibility Study. However, several modifications of Alternative 3 would make it more protective including:

1. The remedy shall be designed to attain the cleanup standards listed in Tables III, V, and VII of Section VIII, which include a more stringent soil. cleanup standard for dioxin as well as more stringent requirements for flood control.

2. Drums containing hazardous substances but containing less than 1 ppb of dioxin shall be transported off-site for treatment or disposal.

3. A Feasibility Study shall be performed at least every two (2) years following the installation of the remedy to develop, screen and assess remedial alternatives. These Feasibility Studies will evaluate the performance of the remedy as well as new and alternative technologies.

The components of Alternative 3 with the above modifications are described below:

1. Construct a slurry wall encircling the site tying into the silt layer underlying the site.

2. Construct a flood wall and appurtenances to protect the site from the 100 year flood. Such flood wall shall conform to the specifications and guidances of the U.S. Army Corps of Engineers and the NJDEP and shall include as a design consideration the impact of the proposed Passaic River flood control project.

3. Disassemble and decontaminate all non-porous permanent structures and materials to the maximum extent practicable for off-site reuse, recycle or disposal.

4. Transport all drums containing hazardous substances but containing less than 1 ppb of TCDD off site for treatment or disposal.

5. Demolish all remaining structures on site and secure all materials contaminated above 1 ppb of TCDD on site. Secured materials shall be segregated to the maximum extent practicable to afford access to and facilitate removal of more highly contaminated materials, should such removal be selected as a remedy at a later date.

6. Stabilize and immobilize the contents of the remaining drums of dioxin contaminated materials.

7. Locate and plug underground conduits and re-route active systems.

8. Haul, empty, spread and compact the contaminated materials presently stored at 120 Lister Avenue; decontaminate the shipping containers for off-site reuse, recycle or disposal.

9. Install, operate, and maintain a ground water withdrawal system designed to maintain a hydraulic gradient preventing the migration of ground water from the volume contained within the slurry wall.

10. Install, operate, and maintain a treatment system for ground water and other aqueous liquids.

11. Construct a surficial cap consisting of suitable materials designed to meet the requirements of the Resource Conservation and Recovery Act.

12. Implement suitable monitoring, contingency, operation and maintenance and site security plans to ensure the protection of human health and the environment during and after the installation of the selected alternative.

13. On-site placement and capping of the sludge generated from all wastewater treatment processes until such time that an alternative method of sludge management is approved.

14. Design, construct and operate the remedy to attain the cleanup standards listed in Tables III, V, and VII of Section VIII of the Record of Decision.

15. Perform a Feasibility Study every 24 months following the installation of the selected interim remedy to develop, screen and assess remedial alternatives and to assess the performance of the selected remedy.

It should be noted that, although the cap described in the Feasibility Study includes a layer of concrete at the surface, the RCRA regulations do not specifically require the cap to have a concrete component. Since the proposed concrete portion of the cap could interfere with future modifications of the remedy which may be needed, the alternative described above does not specifically call for a concrete cap.

The remedial alternative described above is consistent with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R Part 300. This remedial alternative has been determined to be consistent with Section 121 of SARA. In particular, this alternative has been determined to provide adequate protection of public health and welfare and the environment, to be cost-effective and to be appropriate when balanced against the availability of Trust Fund monies for use at other sites.

X. Enforcement

As noted in the previous section concerning the background chronology, the NJDEP has issued two Administrative Consent Order for the Diamond Shamrock Site and EPA entered into a voluntary cost reimbursement agreement with Diamond Shamrock.

EPA and NJDEP plan to negotiate with Diamond Shamrock for the design and implementation of the selected remedy. EPA intends that any agreement for Diamond Shamrock to design and implement the remedy would be in the form of a Consent Decree entered into pursuant to Section 122(d) of CERCLA.

XI. Community Relations

The discovery of 2,3,7,8-TCDD in the Ironbound Community in 1983 caused grave concerns by the residents in the vicinity over the habitability of the area, as well as fears related to the potential long term health effects of the presence of TCDD in the environment.

Total or partial excavation and removal of contaminants from the site has been encouraged by the public, however, it is noted that there is currently no facility in the United States that can accept dioxin contaminated materials from the site, nor is one anticipated in the near future. Lacking the ability to implement an off-site removal in the near future, it is believed that the community would accept, grudgingly, a containment alternative that would minimize potential health and safety concerns until such time that removal or treatment of contaminant materials becomes realistically achievable. It therefore appears that the selected alternative would satisfy those concerns. Specific comments from community representatives are addressed in the Responsiveness Summary, which is included as an attachment to this document.

XIII. Glossary of Terms and Acronyms

ARARs	- applicable or relevant and appropriate requirements of Federal and State environmental laws
CERCLA	- the Comprehensive Environmental Response Compensation and Liability Act, as amended by the Superfund Amendments and Reauthorization Act of 1986
DDT	- Dichlorodiphenyl Trichloroethane
Dioxin	- 2,3,7,8-tetrachloredibenzo-p-dioxin, also referred to as TCDD or 2,3,7,8-TCDD
EPA	- the U.S. Environmental Protection Agency
Feasibility Study	- as used herein, "the Feasibility Study" refers to the feasibility study performed by Diamond Shamrock Chemicals Company for the properties at 80 and 120 Lister Avenue pursuant to two Administrative Consent Orders issued by NJDEP
NCP	- the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR Part 300)
NJDEP	- the New Jersey Department of Environmental Protection
Off-Site	- as used herein, "off-site" refers to all other areas than 80 and 120 Lister Avenue, Newark, NJ
PIRAP	- Proposed Interim Remedial Action Plan
RCRA	- the Resource Conservation and Recovery Act, as amended
Remedial Investigation	- as used herein, "the Remedial Investigation" refers to the site evaluations performed by Diamond Shamrock Chemicals Company for the properties at 80 and 120 Lister Avenue pursuant to two Administrative Consent Orders issued by NJDEP
ROD	- Record of Decision
SARA	- the Superfund Amendments and Reauthorization Act of 1986

Site - The Diamond Shamrock Superfund Site (also known as the Diamond Alkali Superfund site) in its broadest sense, is the former pesticides manufacturing facility at 80 Lister Avenue and the surrounding areas which have been contaminated by hazardous substances which originated at 80 Lister Avenue. However, "the site," as used in this Record of Decision, refers only to the portions of the Diamond Shamrock Superfund Site located at 80 and 120 Lister Avenue.

APPENDIX A

Responsiveness Summary

RESPONSIVENESS SUMMARY

This Responsiveness Summary is divided into two parts. Part I is the Responsiveness Summary for comments received at the February 20, 1986 public hearing on the Feasibility Study (FS) and for written comments on the FS. Part I was prepared by the New Jersey Department of Environmental Protection (NJDEP) with input from the U.S. Environmental Protection Agency (EPA).

Part II is the Responsiveness Summary for comments received at the August 11, 1987, public meeting on the Proposed Interim Remedial Action Plan (PIRAP) and for written comments on the PIRAP. Part II was prepared jointly by EPA and NJDEP and the responses represent the positions of both Agencies.

In both Parts I and II, similar comments from different persons have been consolidated to reduce the need for repetitious responses.

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Appendix A - Part I

Diamond Shamrock Site
80 and 120 Lister Avenue
Newark, Essex County
New Jersey

Responsiveness Summary
for the
On-Site Feasibility Study

February 1986

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This community relations responsiveness summary, prepared as part of the Record of Decision (ROD) is divided into the following sections:

I. Background of Community Involvement and Concerns

This is a brief history of community interest in the Diamond Shamrock site and a chronology of community relations activities conducted by the New Jersey Department of Environmental Protection (NJDEP) and the United States Environmental Protection Agency (USEPA) prior to and during the Remedial Investigation/Feasibility Study (RI/FS).

II. Summary of Major Questions and Comments received during the Public Comment Period and NJDEP's Responses

This is a summary of major questions and comments directed to NJDEP and Diamond Shamrock during the February 20, 1986 Public Hearing regarding the results of the Feasibility Study and sent to NJDEP during the public comment period. NJDEP's responses are included in this section.

III. Remaining Concerns

Discussion of remaining community concerns of which NJDEP, USEPA, and Diamond Shamrock should be aware in conducting the remedial design and remedial actions at the Diamond Shamrock site.

Attachments

A. Agenda and Fact Sheet distributed at the 2/20/86 Public Hearing.
B. List of Attendees at the 2/20/86 Public Hearing.
C. List of Speakers at the 2/20/86 Public Hearing.
D. Letters sent to NJDEP during the public comment period.

I. Background of Community Involvement and Concerns

The discovery of dioxin contamination at the Diamond Shamrock site stimulated active community involvement, especially among residents of the Ironbound section of Newark. An organized citizen group, Ironbound Residents Against Toxics, is apprised of all significant activities and included in all informal briefings for local officials related to the Diamond Shamrock site. The initiation of residential sampling and subsequent remedial action created increased awareness and involvement on behalf of citizens with respect to the activities of the New Jersey Department of Environmental Protection (NJDEP) and the United States Environmental Protection Agency (USEPA) at Diamond Shamrock. On several occasions the Department has consulted with this group regarding strategies for disseminating information to and communicating with residents regarding the sensitive issue concerning sampling and remediation of their properties. Following is a chronology outlining community relations activities over the past several years.

Chronology of Community Relations Activities

Date	Event
12/82	-NJDEP released fishing advisories for reduced consumption of White Catfish in the Passaic River. The River abutting 80 Lister Ave. was closed for commercial fishing of American Eels and striped bass.
6/2/83	-Briefing with NJDEP, USEPA, and New Jersey Department of Health (NJDOH) for Newark officials. -Press conference during which time the Governor offered alternate housing to affected residents. -Commissioners Hughey (NJDEP) and Goldstein (NJDOH) met with residents in Newark. Fact sheets were distributed.
6/8/83	-Public meeting (sponsored by Mayor Gibson) with NJDEP (Tyler, Berkowitz), USEPA, NJDOH at Roosevelt Housing Development.
6/10/83	-USEPA letter to residents re: dioxin sampling during week of 6/13/83.
6/20/83	-Public meeting to discuss current findings with residents (Governor Kean).
6/83	-USEPA held several informal briefings with D. Cherot (Newark Dept. of Health and Welfare) & Staff. -USEPA initiated numerous door-to-door contacts re: ongoing activities (L. Johnson & R. Cahill).
6/3/84	-NJDEP and USEPA officials met with residents re: start of habitability sampling.

	-NJDOH brought a mobile van to the Ironbound section to provide residents with information about dioxin. -Command post with State workers set up at 17 Riverview Court.
6/6/84	-State officials attended a meeting at the Roosevelt Housing Project. -NJDEP and NJDOH went door-to-door to discuss residential sampling results. The Governor and other state officials held a press conference in Newark and a meeting at a local tavern to discuss these results.
6/8/84	-Public meeting organized by Mayor Gibson at Roosevelt Housing Project (NJDEP officials in attendance).
6/13/84	-NJDEP community relations visit and letter distribution to residents re: stabilization and containment action at Brady Iron & Metals, Inc.
6/18/84	-Press conference with Dr. Dewling (USEPA). -Press event re: Federal Investigation Team (FIT) demonstration at Hayes Park East.
6/84	-NJDOH distributed fact sheets, questionnaires and addressed questions re: health concerns in Ironbound.
8/9-11/84	-NJDEP sponsored Dioxin Public Information Open House.
1/10/85	-NJDEP letter to residents re: off-site cleanup (ACO II) and sampling activities (beginning 1/14/85).
2/18/85	-NJDEP informal briefing for Newark officials and community representatives re: ACO's I & II.
3/12/85	-NJDEP meeting in Newark to discuss traffic logistics with police department, fire department, and emergency response coordinator.
3/14/85	-USEPA distribution of letters and consent forms to 17 residents re: residential sampling on 3/19/85.
4/2/85	-NJDEP letter (English and Spanish) to residents re: parkway median remediation schedule on 3/19/85.
6/19/85	-NJDEP informal briefing with Newark officials and community representatives re: status of the dioxin cleanup.
8/9/85	-NJDEP hand delivered letters to residents and explained sampling results from their property.
9/9/85	-NJDEP hand delivered letters to residents requesting their cooperation for USEPA's residential sampling during September 1985.

1/8/86	-NJDEP distribution of letters (English and Spanish) to residents regarding January 11-16, 1986 street cleaning activities.
2/20/86	-NJDEP Public Hearing (in Newark) to present results of Feasibility Study and receive comments.

II. Summary of major questions/and comments received during the public comment period and NJDEP's responses

In December 1985, the Feasibility Study was placed in the following repositories for review: Newark Public Library, 5 Washington Street; Newark Public Library, 140 Van Buren Street; Newark City Clerk's Office, 920 Broad Street; and NJDEP, 432 E. State Street, Trenton. NJDEP issued press releases and contacted local officials, as well as community representatives regarding the availability of the Feasibility Study at these repositories.

On February 20, 1986 NJDEP held a public hearing to present the results of, and receive comments/questions regarding, the Feasibility Study. (See Attachment A: agenda and fact sheet distributed at the hearing). The hearing was held at St. Aloysius Theater, 89 Fleming Avenue in Newark. In order to select the most appropriate and accessible meeting location, St. Aloysius Theater was chosen in consultation with Mr. Arnold Cohen (Ironbound Residents Against Toxics-IRAT), Mr. Michael Gordon (Attorney for IRAT), as well as local officials (E. Hill, D. Cherot, H. Martinez). Notification of the public hearing was accomplished through press releases and direct mailing of notices to local, state and federal officials, as well as concerned citizens. Approximately 150 people attended although only approximately 80 people signed the attendance sheet (See Attachment B), and 11 people commented during the hearing (See Attachment C). Responses to questions and comments, for the most part, were not stated at the hearing. The public comment period was held from February 20, 1986 through March 21, 1986. In addition to the comments made during the public hearing five letters were received by the Department during this period. (See Attachment D).

During the public hearing Mr. Hutton, Director of Environmental Affairs for Diamond Shamrock, gave a presentation of six remedial action alternatives that were considered in the Feasibility Study. These are:

1. No action;

2. In-situ slurry wall with cap;

3. Ground water pumping and treatment, with in-situ slurry wall and cap;

4. Excavation with thermal treatment of materials with over 7 parts per billion (ppb) dioxin coupled with in-situ slurry wall and cap;

5. Excavation and construction of an on-site landfill for the materials with over 7 ppb dioxin coupled with a slurry wall and cap; and

6. Excavation, loading, and transportation of contaminated on-site materials and off-site commercial disposal, a slurry wall built for stability and ground water control during excavation, and mitigation of migration of remaining dioxin below the 7 ppb level after remediation.

Mr. Hutton then discussed Diamond Shamrock's proposed remedial alternative which includes a ground water pumping and treatment system, in-situ slurry wall, and capping.

Following is a summary, organized by subject, of all major questions/comments received by NJDEP at the public hearing and during the comment period. Major subjects include:

- Permanent Removal;
- Efforts to Secure an Off-Site Disposal Facility;
- Development of a Licensed Dioxin Disposal Facility;
- Adequacy of Proposed Site Cleanup;
- Consideration of Technologies for Safe Excavation;
- Applicability of State Laws for Hazardous Site Remediation;
- Long-Term Site Maintenance;
- Containment Option;
- Proposed Alternative Vis a Vis the Passaic River; and
- Other Issues.

Permanent Removal

The overriding and recurring theme expressed by the speakers at the hearing was that the only acceptable remedial alternatives would entail the total removal of hazardous waste from the Diamond Shamrock site at 80 and 120 Lister Avenue. Community representatives appealed to NJDEP to protect the interests of the Ironbound residents and businesses who have already experienced the hardships and stigma associated with dioxin contamination in their neighborhood. The alternative proposed by Diamound Shamrock is perceived by some residents and others as a continuation of the problem, rather than a remedy.

1.+ A disposal site cannot be in Essex County. Total removal is the only acceptable option.

Response: If implemented at the present time, the total removal option would result in greater risk to community residents than would the proposed remedial action plan. The disadvantages of the total removal alternatives are discussed below:

The option of off-site land disposal without treatment is not a viable one. There are currently no land disposal facilities permitted for disposal of dioxin wastes, and effective on November 8, 1988, regulations promulgated under the Federal Resource Conservation and Recovery Act (RCRA) will ban the land disposal and long-term storage of dioxin wastes unless the wastes meet treatment standards, which are achievable by incineration. A waiver from the land disposal ban is available under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (Superfund law) authority for land disposal at the Diamond Shamrock site because the alternatives which comply with the ban are less protective than the proposed plan. However, CERCLA does not give authority for such a waiver for off-site disposal or storage.

Since there are no existing off-site commercial hazardous waste thermal treatment units of adequate capacity for the cleanup of the Diamond Shamrock site which are permitted to treat dioxin or have pending applications to treat dioxin, an off-site thermal treatment unit would have to be designed, constructed and tested. In addition, the unit would have to be sited, another step in the time consuming process of implementing this remedy. Siting treatment and disposal locations for wastes from CERCLA cleanups has delayed cleanups in the past and would be expected to be especially difficult for an incinerator capable of destroying dioxins. It would take at least six years and possibly much longer to implement a remedy which relies on off-site treatment.

+ All comments and questions are numbered for the purpose of cross referencing the text.

In addition, the excavation necessary for total removal presents significant risks. The hazardous substances to be excavated are far more concentrated than those substances which were excavated at off-site properties. Of particular concern would be the risk resulting from airborne releases of hazardous substances. While it has been suggested that excavation could take place under a dome with the airborne hazardous substances vented through carbon filters, this technology has yet to be demonstrated in an application similar to its possible use at this site.

By contrast, the proposed remedial action plan can be implemented in approximately two years with minimal risks during implementation. The proposed plan will provide adequate protection of health and the environment much sooner than alternatives involving total removal and it can be supplemented by additional remedial actions in the future,if feasible.

2.+ We understand that the cleanup plan proposes to place dioxin-laden soils in a landfill on their property in this area. ...All landfills will eventually fail. ...Have other treatment technologies been considered here? ...The only advantage seems to be a cheap and convenient way for Diamond Shamrock to dispose of these wastes. This is not in the best interests of the community. DEP's first priority should be to provide maximum protection of public health and the environment and not to make life "easy" for industry. We hope NJDEP will not approve this proposed plan but rather consider cleanup options that will remove permanently, destroy or detoxify the dioxin-laden soils.

Response: Diamond Shamrock and their contractor, IT Corporation, have considered the full range of potentially viable alternatives in the Feasibility Study submitted to NJDEP and USEPA in October of 1985. This document summarized the findings of an extensive Remedial Investigation conducted in 1984 and 1985. Both of these documents were placed in public repositories for review in December 1985.

The findings of the Feasibility Study indicate that treatment technologies for large quantities of dioxin-contaminated materials are not sufficiently developed to warrant recommendation at this time. Additionally, there are currently no approved disposal facilities available to accept these wastes. Consequently, NJDEP is recommending securing

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+ Paraphrased comment, received from Stephen Lester and Lois Gibbs. Refer to Attachment D for letter.

contaminated materials on site. It is the position of NJDEP that this on-site containment is an interim solution, and is recommended in order to stop the migration of hazardous materials. Provisions will be made to periodically review the status of available technologies in order to conduct environmentally safe destruction of on-site materials in the future.

The NJDEP believes that the proposed remedy is more protective of health and environment than total removal at this time. With regard to any engineered solution, operational difficulties may develop at any time. Accordingly, sufficient provisons for proper operation and maintenance of the remedy must be included. In accordance with Section 121 (c) of CERCLA, additional remedial actions would be taken should the remedy prove to be ineffective; however, NJDEP regards this as a remote possibility.

More specifically, the proposed remedy would require operation and maintenance of a ground water pumping and treatment system for the forseeable future. The pumping would reverse the present direction of ground water flow and would result in a net influx of groundwater into the contained volume. In addition, the cap would be inspected for erosion or cracking and repairs would be made as needed. Should a significant increase in groundwater infiltration occur, it would immediately be detected, and repairs could be made at that time.

Thermal treatment, which is currently the most developed and effective of treatment alternatives, was found less protective than the proposed containment plan if implemented at the present time (see the response to comment #1).

3.+ I fundamentally agree with the sixth remedial alternative considered (i.e., excavation, loading and transportation of contaminated on-site materials for off-site commercial disposal). Since the decisions made here will be an accommodation of existing law for any of the alternatives, ... perhaps an arrangement between NJDEP and USEPA to have already established "dioxin-qualified" out-of-state landfills accept our dioxin waste... until New Jersey has its own facility. Additionally, we both know there are ways and means to excavate safely without further contaminating air, water, and land, however costly to Diamond Shamrock. ++

+ Paraphrased comment received from Maria Del Tufo, R.T.. Refer to Attachment D for letter.

++ This issue is addressed later in this Responsiveness Summary.

Response: There are no commercial facilities, either currently or in the near future, available for the treatment or disposal of dioxin-contaminated wastes. We therefore believe that the only viable alternative available is to secure and contain all contaminated materials on site until an appropriate technology becomes available. There are questions to be answered regarding safe methods of excavation, identify areas most likely to be impacted, and the means for addressing those potential impacts. The NJDEP is committed to a comprehensive study of excavation risks and a means for controlling those risks by requiring a feasibility study to be performed every two years.

Efforts to Secure an Off-Site Disposal Facility

4.+ Diamond Shamrock has failed to comply with 7:26-1.4 by not exploring all alternatives and failing to list detailed reasons why off-site disposal is not available.

Response: Diamond Shamrock has, in fact, explored the possibility of off-site disposal as evidenced by the development of Alternative No. 6 which explored the possibility of off-site disposal at a hypothetically approved landfill and incineration facility. This alternative has been rejected due to the reality that there are no currently approved disposal facilities available in the United States as noted in the response to comment #1. Although treatment or disposal sites may become available in the future, we cannot predict when or if this will occur. NJDEP recognizes the need to respond to the situation as it is currently presented. In addition, it is the position of NJDEP that all potentially viable alternatives have been investigated and evaluated by Diamond Shamrock.

5. Diamond Shamrock has failed to fulfill its obligation to provide communications regarding the availability of off-site options for disposal. The Feasibility Study does not contain documentation of communication with hazardous waste disposal facilities. This prevents a meaningful evaluation of available alternatives. Remember NJDEP especially requested that this information be contained in the study back in August 1985.

Response: Although Diamond Shamrock did not present communications regarding off-site disposal options within the Feasibility Study, a response has been received by NJDEP subsequent to the completion of the Feasibility Study. Although it is known that there are no approved disposal facilities which can accept the TCDD-contaminated residues from the Diamond Shamrock site, Diamond Shamrock's contractor, IT Corporation, made inquires at twelve facilities that accept wastes containing PCB-contaminated residues. These disposal facilities were selected since PCB disposal facilities would be most likely to accept TCDD wastes. All indicated that wastes containing TCDD residues would not be accepted. USEPA has confirmed the fact that there are no commercial treatment or disposal facilities that are permitted in the United States. This information was reviewed by NJDEP and forwarded to Michael Gordon, Esq. contaminated soils at concentrations up to 80 ppb. Facilities such as this offer promise for future treatment options.

+ One of several comments received from Michael Gordon, Esq. Refer to Attachment D for letter.

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6. Diamond Shamrock has not evaluated the disposal of dioxin-contaminated soil at licensed international disposal sites.

Response: NJDEP requested the evaluation of this alternative in our response to the Draft Feasibility Study. Diamond Shamrock's response indicates that although dioxin-contaminated soil may be disposed of at one European facility, the political and institutional constraints are such that a timely resolution would be unrealistic since this facility has been established for local disposal purposes. While NJDEP recognizes the benefits that would be realized by such overseas disposal, we question several factors including: Diamond Shamrock's ability to participate in such a plan; the time that would undoubtedly be required for implementation; the appropriateness of such an extreme remedy in terms of disposing of more than 70,000 cubic yards of contaminated materials; and compliance with all regulations imposed by the receiving country.

7.+ The City of Newark received correspondence from West Germany's Department of Environmental Protection indicating that there is a registered landfill for dioxin-contaminated waste in Kassel, West Germany. Director Alvin Zach, Newark Department of Engineering, urged NJDEP to require Diamond Shamrock to assess this facility, as well as other appropriate international disposal facilities.

Response: At the request of NJDEP, Diamond Shamrock has investigated the possibility of such disposal of dioxin-contaminated materials. As indicated by the tone of the response, the facility referred to in West Germany does not seek the disposal of foreign TCDD-waste materials, citing political constraints and local usage preference. In addition, for reasons detailed in the previous response, we question the viability and practicality of such a disposal option.

8.++ Request via correspondence from Mayor Gibson that NJDEP require Diamond Shamrock to explore the use of USEPA's first registered disposal site for dioxin in the United States. The J.M. Huber Corporation in Texas was recently permitted to accept dioxin wastes. Presuming that such a disposal facility is available, storage of dioxin should not be permitted in Newark.

+ Comment received from Director Alvin Zach. Refer to Attachment D for letter.

++ Comment received from Mayor Gibson. Refer to Attachment D for letter.

Response: Investigation by NJDEP technical staff has determined that the Texas facility referred to, at present, does not have the necessary USEPA permit to treat dioxin. However, this facility may accept dioxin wastes for research and future engineering design purposes. The inappropriateness of this facility is indicated by the fact that it will process a maximum of only 0.5 pound/hour, and that it is effective on contaminated soils at concentrations up to 80 ppb. Facilities such as this offer promise for future treatment options.

9. Have you tried to locate any off-site facilities where this material could be temporarily stored?

Response: There are currently no facilities available in the United States that accept TCDD-contaminated wastes for either storage or disposal purposes. Section 3004(e) of the Resources Conservation and Recovery Act (RCRA) prohibits land disposal of TCDD materials, effective November 8, 1988. Further, Section 3004 (j) of RCRA restricts storage of wastes prohibited from land disposal under most circumstances (see pages 40641 - 40643 of the November 7, 1986 Federal Register for the specific regulations). Even if storage of these wastes were possible, such a facility does not exist, as indicated previously.

Development of a Licensed Dioxin Disposal Facility

10. Diamond Shamrock has not evaluated the siting, permitting, construction, operation, and maintenance of a new dioxin disposal facility within New Jersey or anywhere else in the world.

Response: Realistically, NJDEP recognizes the difficulties of siting and permitting a new hazardous waste disposal facility for TCDD. We also recognize the desirability of ultimately treating or removing the contamination from this site. This is why the Record of Decision (ROD) will contain provisions for periodically evaluating the feasibility of doing so. In addition, as described previously in the response to comment #1, this option was evaluated and found to be less protective than the proposed plan.

11. Entombment only prolongs the process; it does not solve the cleanup problem. Diamond Shamrock should be required to develop a licensed facility for the disposal of dioxin-contaminated soil.

Response: It is the responsibility of NJDEP to protect human health and the environment. It is our position that the proposed plan provides the greatest protection of all the alternatives. In addition, the containment alternative is considered an interim measure until such time as the feasibility of other treatment or disposal methods is proven.

12. The recommended alternative does not evaluate the cost and legal constraints of seeking to become a licensed, permitted, solid waste or hazardous waste disposal facility within New Jersey. This is what is being recommended by Diamond Shamrock.

Response: Section 121(e) of CERCLA eliminates the need for any federal, state and local permits for CERCLA remedial actions. In addition, Section 121(d)(4) of CERCLA allows for waivers of the applicable or relevant and appropriate requirements of federal and state environmental laws under certain circumstances. The ROD will include the justification of such waivers. Finally, this site is not considered to be a disposal facility in the sense that waste materials from locations other than those originating at the site will not be accepted.

Adequacy of Proposed Site Cleanup

13. Diamond Shamrock has failed to evaluate the impacts of Judge Stanton's order and opinion. These require the site remediation to achieve the highest level of cleanup that the boundaries of our known technology will allow.

Response: Judge Stanton's order requires the cleanup "to the greatest extent feasible within the bounds of known technology." Similarly, section 121(b) of CERCLA requires the selection of a remedy that uses permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. It is the position of NJDEP that neither Judge Stanton's order nor section 121(b) of CERCLA were intended to maximize the use of technology as an end in itself, but as a means for ensuring the protection of health and the environment. Since the alternatives which have a greater reliance on technology are less protective than the proposed remedial action plan at the present time, the proposed plan does utilize known technologies to the extent practicable or feasible for protecting health and the environment.

14. This site produced chemicals for 63 years. There are probably a lot more chemicals than Diamond Shamrock is willing to deal with. Geologic and major engineering judgements are being made based on two chemicals (dioxin and DDT). What about the other chemicals at this site that have very different characteristics from dioxin and DDT?

Response: The risk assessment developed by Diamond Shamrock and their contractor, IT Corporation, evaluated risks posed by all chemicals detected in significant concentrations on site. The evaluation was less detailed for chemicals which have a minor contribution to the total risk.

15. Diamond Shamrock has improperly developed a ground water decontamination program based on the chemical characteristics of two compounds when there are a hundred compounds contaminating the site. The likelihood of success of any ground water program must evaluate the mobility, toxicity, etc. of all compounds present above the New Jersey standard of 100 ppb being used for ground water cleanups at industrial sites. The Feasibility Study does not recognize the proper cleanup goal of remediation until all contaminants are below the 10 ppb standard.

Response: The recommended remedial alternative includes a ground water pumping plan to reverse the downward flow of ground water through the sand unit. The purpose of the pumping is to prevent the migration of the contaminants beneath the cap and within the slurry wall from moving off site. The pumped ground water will then be treated to remove all contaminants to levels appropriate for discharge to the Passaic River or to a wastewater treatment facility.

The proposed plan is not intended as a ground water decontamination program. It is intended only to prevent the release of pollutants from the 80 and 120 Lister Avenue properties to the ground water. The cleanup of all ground water contamination attributable to the Diamond Shamrock site is outside of the scope of the Remedial Investigation and Feasibility Study. NJDEP is committed to further investigate ground water contamination in the vicinity of 80 and 120 Lister Avenue and to implement additional remedial actions, as appropriate.

New Jersey does not have a standard of 10 ppb for ground water cleanups at industrial sites. New Jersey's interim ground water criteria are established on a "per chemical" basis. For volatile organic compounds, the levels established are 5 ppb for each carcinogenic compound and a total of 50 ppb for noncarcinogenic compounds which do not have a federal Maximum Contaminant Level. Nonvolatile organic compounds have individual criteria that can be obtained from the Department's Division of Water Resources. It is NJDEP's plan to satisfy the requirements for effluent discharges.

Consideration of Technologies for Safe Excavation

16. Diamond Shamrock has failed to evaluate the impacts of known cleanup and construction methodologies on the options requiring excavation of materials, i.e. reverse pressure within a covered work area. This means the evaluation of alternatives presented is clearly misleading. Diamond Shamrock relies on this misinformation to eliminate any options containing excavation of soils.

Response: As indicated, excavation of contaminated materials is not considered to be a viable option at this time. When disposal sites or satisfactory technologies for treatment are sufficiently developed, safe excavation methods will be evaluated and implemented to the maximum extent practicable. (See response to comments #1 and #3).

17. There are safe engineering technologies for the excavation of contaminated soils. A structure can be built with negative pressure to draw air in rather than out, thereby reducing the emission of dioxin-contaminated particulates into the atmosphere.

Response: NJDEP is cognizant of special techniques for such construction. However, there are currently no available treatment or disposal facilities in use in the United States for such contaminated materials. (See response to comments #1 and #3).

Applicability of State Laws for Hazardous Site Remediation

18. Diamond Shamrock has failed to evaluate the legal requirements applied by NJDEP to site cleanups in New Jersey. This prevents the evaluation of what laws will be broken by the cleanup option selected by Diamond Shamrock.

Response: Under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (Superfund Law) authority, which allows for an on-site remedy that does not attain all applicable or relevant and appropriate requirements of federal and state laws, NJDEP is proposing implementation of a modified version of the alternative that was proposed by Diamond Shamrock. Furthermore, justification will be provided in the Record of Decision (ROD) under Section 121(d)(4) of CERCLA for those requirements which will not be met.

19. The Feasibility Study is incomplete and cannot be properly evaluated (e.g., there is no listing/discussion of state laws that are applicable to the recommended alternative).

Response: Although NJDEP notes that the Feasibility Study does not discuss relevant state or federal regulations, it is the responsibility of NJDEP to identify and evaluate applicable or relevant and appropriate requirements in any enforcement action to ensure that the selected alternative is in compliance with relevant regulations. As indicated above, the selected remedy is being implemented under CERCLA authority, which controls the legal requirements. Although CERCLA does not require obtaining permits prior to initiation of remedial activities, CERCLA does require that these actions meet the substantive requirements of such permits.

20. Diamond Shamrock has failed to evaluate the New Jersey requirements for thickness and permeability of liners at new waste disposal locations. Diamond Shamrock's reliance on the present silt layer is illegal.

Response: CERCLA allows for the selection of a remedy which may not meet all requirements under the circumstances described in Section 121(d)(4). (Refer to response for comments #18 and #19 for further discussion).

Long-Term Site Maintenance

21. Regardless of the selected remedial alternative, a long-term monitoring program is necessary during and after the remedial work to ensure environmental safety. The monitoring program must provide data/information that is readily useable by officials to assess damage to health and the environment. The monitoring program should be peer reviewed by appropriate scientists within and outside of government. The Essex County Office of Environmental Health is available for assistance in this regard.

Response: NJDEP has the responsibility and capabilities to establish a long-term monitoring plan. Indeed, this is a requirement of the selected remedy. NJDEP routinely seeks the expertise of outside health agencies, as needed, and informs them of programs established to protect public health and safety. Toward this end we appreciate the interest of the Essex County Office of Environmental Health.

22. It is difficult to comprehend maintaining this site in perpetuity, which will ultimately happen if we do not remove it. Diamond Shamrock will be able to abandon this site after 30 years and the community will be left with the responsibility of maintaining the site forever. What is the longest documented experience in operating a pumping system of this kind? This is a temporary solution to a permanent problem.

Response: Financial assurances will be required of Diamond Shamrock for continual maintenance of the site until such time as the contaminants are either removed or no longer pose a threat to human health or the environment. There will be no "abandonment" of the site after 30 years, although NJDEP hopes that a permanent resolution will be realized before that time. If subsequent negotiations with Diamond Shamrock fail, NJDEP is committed to providing the necessary financial assurances to implement the remedy.

Pumping systems are capable of indefinite operation. Although pieces of equipment do wear out, all that is required is component replacement. The same is true for many water treatment technologies that are currently in use by water companies throughout the state and nation, such as air stripping and activated carbon for the removal of certain organic compounds, as well as filtration, flocculation, sedimentation, and ion exchange for other contaminants.

23. Presently, the law is written so that the Resource Conservation and Recovery Act (RCRA) requirements for a site cap terminate after 30 years. Diamond Shamrock can walk away "scot free" after 30 years. It is highly unlikely to operate the proposed pumping system for 30 years. Diamond Shamrock plans to leave this site after 30 years.

Response: These actions are being taken under the authority of CERCLA which provides for operation and maintenance at Superfund sites for an indefinite period. RCRA is being used to provide technical guidance for evaluating and developing the containment system requirements only. The proposed remedy includes provisions for continual operation and maintenance, as well as monitoring, until contamination is removed or treated to completion. These provisions will be specified in a Federal Judicial Consent Decree, a legally binding document.

24. Diamond Shamrock has failed to properly evaluate the impact to the environment and public health of their abandonment of the site once the 30-year period of site maintenance ends. This failure is critical since New Jersey law requires remedial activity until the site has been remediated.

Response: As previously noted, Diamond Shamrock cannot abandon the site after 30 years. Even if the Corporation goes bankrupt, its financial guarantees would remain in effect.

25. It is misleading to say that there is an upward hydraulic gradient at the site. When the cap deteriorates and the pump falls apart the natural hydraulic gradient will be downward and into the Passaic River. Diamond Shamrock is proposing a temporary non-solution to a permanent problem.

Response: The selected remedy will be implemented with the approval and proper financial assurance from Diamond Shamrock. As such, maintenance of pumps and all structures will be ensured, including monitoring activities to sustain their effectiveness indefinitely. (See response to comments #22 and #23 for further discussion).

Containment Option

26. Major concern was expressed regarding the permanency of Diamond Shamrock's recommended cleanup alternative. The City of Newark (per D. Cherot) presumes that Diamond Shamrock's recommended alternative is an interim measure and that the NJDEP will not allow the site to become a permanent hazardous waste facility in Newark.

Response: The recommended remedy is considered to be an interim measure. The recommendation is made because NJDEP wishes to initiate site remediation measures now to reduce the risks posed by the site. Since no disposal facilities or treatment technologies are currently acceptable, any recommendation other than some form of on-site containment would delay the initiation of remediation until such facilities become available or technologies are sufficiently developed. The duration of the proposed containment remedy will depend on a number of factors including the performance of the remedy, development of measures to minimize excavation risks, the development of new technologies, and the availability of existing technologies such as incineration for dioxin wastes.

27. Where has containment of dioxin been permitted?

Response: Containment has been implemented at sites in Arkansas and Seveso, Italy. Containment remedies for dioxin wastes have been selected by USEPA for the Love Canal site and Hyde Park Landfill in New York State.

28. Are you making a business decision, i.e., choosing an alternative that will cost 95% less by storing it on site rather than getting rid of it?

Response: NJDEP does not make "business decisions" regarding cases that are being addressed by responsible parties. The proposed containment remedy is advocated by NJDEP because it is presently the most protective alternative. NJDEP is committed to recommending treatment or removal when these can be reliably implemented. As indicated in the previous response, containment of dioxin wastes is being implemented elsewhere.

Proposed Alternative Vis a Vis the Passaic River

29. Diamond Shamrock has failed to evaluate the impact of flooding upon the project and the proposed use of this area for flood control by the U.S. Army Corps of Engineers.

Response: NJDEP is aware of this potential impact. We have transmitted our concerns to Diamond Shamrock, and have subsequently received their response to our concerns, indicating their willingness to cooperate with NJDEP, USEPA, and the U.S. Army Corps of Engineers. However, due to the magnitude of the Army Corps project, the resolution to this aspect of the selected alternative will be accomplished through coordination on the part of Diamond Shamrock with the U.S. Army Corps during the remedial design phase of the selected alternative. EPA is working with the U.S. Army Corps of Engineers to ensure that the flood control project has no significant adverse impact on the Diamond Shamrock site or other Superfund sites on the Passaic River.

30. Diamond Shamrock has not evaluated the current Passaic River dioxin and DDT contamination and how that relates to moving forward with this recommended alternative.

Response: NJDEP has received the results of a Remedial Investigation of the Passaic River conducted by Diamond Shamrock during the summer of 1985. NJDEP is currently evaluating the findings of that study and will request additional studies, if necessary. Upon completion of our review, and any additional investigations that are deemed necessary, we will be requesting that Diamond Shamrock proceed to prepare an additional Feasibility Study to develop remedial alternatives for the detected contamination.

The remediation of the Passaic River sediments is outside of the scope of the proposed remedial action plan, and will be addressed through another Record of Decision.

31. The Passaic River flood project presents a serious conflict to the encapsulation alternative. This issue needs to be addressed. Proper operation and maintenance (O&M) is also a critical concern.

Response: NJDEP is aware of the Passaic River flood control project, as well as the need to secure the site from 100-year flood conditions. These considerations will be addressed by Diamond Shamrock in their remedial design. Diamond Shamrock will consult with the U.S. Army Corps of Engineers regarding acceptable engineering design considerations. Operation and maintenance of the proposed remedy will be addressed.

Other Issues

32. This 2/20/86 public hearing is not fair in that the public does not have the advantage of knowing the position of NJDEP. A hearing should be held after NJDEP makes a decision regarding the site remedy.

Response: A public meeting was held on August 11, 1987 at which time the Proposed Remedial Action Plan was presented to the public.

33. The recommended cancer risk factor set by Diamond Shamrock is not acceptable. DEP has the responsibility to "get in on the act". It is inappropriate for Diamond Shamrock to set this standard.

Response: NJDEP agrees. The excess cancer risk typically employed by NJDEP for risk assessments is 1×10^{-6} (a one in one million risk factor). In addition, the cleanup standards to be used for the site will be developed by NJDEP and will not be based on the acceptable risk recommendations made by Diamond Shamrock.

34. What is the permeability of the silt?

Response: Permeability of the silt at the site has been tested and is on the order of 10^{-7} centimeters per second. This is equivalent to a clay-type material. Additional testing will be performed to reconfirm this in the design phase. Monitoring will be established to ensure the effectiveness of the remedy.

35. What is NJDEP's schedule for responding to Diamond Shamrock's recommended alternative?

Response: Late September, 1987.

III. Remaining Concerns

The residents of the Ironbound community are disturbed by the presence of hazardous wastes, especially dioxin, in their community. As such, sampling and cleanup activities conducted by NJDEP and USEPA have not been well received, and have generated considerable fears and anxiety on the part of the community. It is essential to maintain a strong community relations program throughout subsequent cleanup activities in order to minimize unfounded concerns. It is essential to emphasize that NJDEP views the proposed remedy as an interim action, and that when technologies for safe removal or destruction become available, they will be implemented.

Attachment

A. Agenda and Fact Sheet distributed at the 2/20/86 Public Meeting.
B. List of Attendees at the 2/20/86 Public Meeting
C. List of Speakers at the 2/20/86 Public Hearing
D. Letters sent to NJDEP during the public comment period

ATTACHMENT A

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

DIVISION OF WASTE MANAGEMENT

HAZARDOUS SITE MITIGATION ADMINISTRATION

Public Hearing to Receive Comment on Feasibility Study
regarding
80 and 120 Lister Avenue, Newark
Thursday, February 20, 1986
7:00 p.m.
St. Aloysius Theater
89 Fleming Avenue
Newark, NJ

AGENDA

1)	Opening Remarks and Introductions	Michael Catania, Deputy Commissioner, NJDEP
2)	Overview of Project Status	Dr. Jorge Berkowitz, Administrator Hazardous Site Mitigation Administration, NJDEP
3)	Presentation: Feasibility Study and Off-Site Remedial Action	Mr. William Hutton, Director Environmental Affairs Diamond Shamrock Corporation
4)	Comments and Questions	

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION

FACT SHEET

on

Feasibility Study

for

80 and 120 Lister Avenue
Newark, NJ
Essex County

Thursday, February 20, 1986

Site Description: The 80 Lister Avenue site occupies approximately 3.5 acres in the Ironbound section of Newark. It is bounded on the north by the Passaic River, on the east by the former Sergeant Chemical Company (120 Lister Avenue, now owned by Diamond Shamrock Corporation), at the southeast corner by the Duralac Company, and on the south and west by the Sherwin-Williams Company. Although presently inactive, the site was used for manufacturing various agricultural and specialty organic chemicals from 1914-1977. The most significant period relative to contamination observed at the site is from the end of World War II to the mid-1970s. During this time, pesticides and phenoxy herbicides were the primary products manufactured. Dioxin may occur as a contaminant in these products.

Background: Concern about the potential environmental impact of dioxin in this area developed as information became available regarding manufacturing processes which had the potential to produce unwanted toxic by-products including dioxin. In the Spring of 1983 a comprehensive sampling program was implemented by the New Jersey Department of Environmental Protection (NJDEP) to investigate facilities which might have produced dioxin. The presence of dioxin at the 80 Lister Avenue site was identified in May 1983. Subsequent to this finding, dioxin was also discovered in several areas throughout the Ironbound section of Newark. Based on the results of initial investigations, Diamond Shamrock entered into an Administrative Consent Order (ACO) with the NJDEP on March 13, 1984. The ACO requires that Diamond Shamrock secure the site, prevent exposure to contaminants, determine the extent of chemical contamination, and complete a site evaluation and a feasibility study of remedial alternatives. On December 20, 1984, Diamond Shamrock entered into a second ACO (ACO II) with NJDEP which requires the investigation and cleanup of all affected off-site areas of contamination in the Ironbound section of Newark.

Status: Almost all of the requirements of both ACO I and ACO II have been fulfilled by Diamond Shamrock. To date, Diamond Shamrock has posted a letter of credit for approximately $16 million in order to conduct the work outlined in both ACOs. Off-site areas have been remediated (see attached summary of off-site remediation), contaminated soils have been transported and containerized, and are being stored temporarily at 120 Lister Avenue. The Draft Feasibility Study for 80 Lister Avenue was completed in December, 1985 and placed in the following repositories for public review:

(1) Newark Public Library, NJ Reference, 5 Washington Street, Newark;
(2) Newark Public Library, 140 Van Buren Street, Newark;
(3) Newark City Clerk's Office, 920 Broad Street, Newark; and
(4) NJDEP, 432 E. State Street, Trenton.

Written comments regarding the Feasibility Study should be submitted to the Department prior to March 21, 1986 and forwarded to:

Grace Singer
New Jersey Department of Environmental Protection
Hazardous Site Mitigation Administration
Office of Community Relations
CN 028
Trenton, NJ 08625

Summary of Remedial Alternatives Considered in the Feasibility Study

An extensive screening of available technologies resulted in the consideration of six remedial action alternatives. These are:

- No action;
- In-situ slurry wall with cap;
- Ground water pumping and treatment, with in-situ slurry wall with cap;
- Excavation with thermal treatment of materials with over 7 parts per billion (ppb) dioxin coupled with in-situ slurry wall and cap;
- Excavation and development of an on-site vault for the materials with over 7 ppb dioxin coupled with a slurry wall and cap; and
- Excavation, loading, and transportation of contaminated on-site materials and off-site commercial disposal, if available; a slurry wall built for stability and ground water control during excavation, and mitigation of migration of remaining dioxin below the 7 ppb level after remediation.

Summary of Off-Site Remediation

According to the December 20, 1984 Administrative Consent Order (ACO II) between Diamond Shamrock and the NJDEP, the following areas in the Ironbound section of Newark have been remediated.

- **Conrail Tracks**: Remediated and Conrail is currently preparing the track for resumption of service.
- **Sherwin Williams Spurs**: Remediated and service has been restored.
- **Residences**: Remediation is complete where access has been granted.
- **Sewers and Catch Basins**: Sewers and catch basins on Raymond Boulevard and Euclid Avenue have been cleaned in accordance with the ACO.
- **Brady Iron and Metals/Hildemann Property/Morris Canal**: Excavation and backfilling is complete. All post samples have been taken; results indicate no contamination remains above 1.0 ppb. The site will be returned to its original contour. Demobilization of equipment and offices is in progress. At the conclusion of remedial activities the site will be fenced.
- **120 Lister Avenue**: Approximately 1,000 containers with contaminated soil have been placed at this site (20,000 cubic yards) for temporary storage. Approximately 800 of these contain material from the Brady site.
- **SCA Trailers**: Decontamination of the nine trailers containing equipment from the SCA warehouse is complete.
- **Street Vacuuming**: This operation was completed in mid-January, 1986.

2/86
NJDEP

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ATTACHMENT B

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
HAZARDOUS SITE MITIGATION ADMINISTRATION
PUBLIC HEARING TO RECEIVE COMMENT

FEASIBILITY STUDY
AT
80 AND 120 LISTER AVENUE

THURSDAY, DECEMBER 20, 1986
7:00 p.m.
ST. ALOYSIUS THEATER
89 FLEMING AVENUE
NEWARK, NJ

	NAME	AFFILIATION	ADDRESS
1.	Joseph J. Bradley	City of Newark	920 Broad St. Newark N.J.
2.	Thomas J. Allen	CE Alumnus	Bloomfield, N.J.
3.	Michael J. Carty		145 [illegible] Ave Hillsdale, N.J. 07642
4.	Robert Snyder		214 Entrance [illegible] [illegible] N.J.
5.	[illegible] Melo		[illegible]
6.	[illegible]	[illegible]	[illegible]
	Emma Rapert		[illegible]
	Alexandra Pietrucha		[illegible] Broad St
	W. Chert	Newark Health & Welfare	110 William St Newark NJ

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
HAZARDOUS SITE MITIGATION ADMINISTRATION
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THURSDAY, DECEMBER 20, 1986
7:00 p.m.
ST. ALOYSIUS THEATER
89 FLEMING AVENUE
NEWARK, NJ

	NAME	AFFILIATION	ADDRESS
1.	[illegible] Campbell	Woodward-Clyde	Wayne, NJ
2.	[illegible]	[illegible]	N.Y.
3.	Raymond Basso	EPA	26 Federal Plaza, NY
4.	Jonathan [illegible]	EPA	26 Federal Plaza, NY
5.	Lisa Jordan	NJDEP	Trenton, NJ
6.	Bob Gallagher	NJDEP	TRENTON NJ
7.	Frank Stellano		Trenton NJ
8.	[illegible]		Kearny NJ
9.	Kerry [illegible]	DEP	Trenton NJ
0.	Nancy Vance	DEP	Trenton NJ
1.	[illegible]	City Council	Newark
2.	[illegible]	PSC	
3.	Terry [illegible]	UCC	Houston

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	NAME	AFFILIATION	ADDRESS
4.	P.7. Smith	ATK/WC	HOUSTON, TX
5.	Russell Keily		Summit, N. J.
6.	Sandy King	N.J. Network News	Trenton
7.	June Kruszewski		27 Schalk ST
8.	Arnold Cohen	ICATW	48 Rand St Newk
9.	Bertha Horowitz		329 Hillside Ave
0.	[illegible] Horowitz		
1.			
2.			
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NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
HAZARDOUS SITE MITIGATION ADMINISTRATION
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89 FLEMING AVENUE
NEWARK, NJ

NAME	AFFILIATION	ADDRESS
1. Christopher J Motta		36 Maple Lk Rd Kinnelon
Frank J Marshall	NJ Dept Health	John Fitch Plaza Trenton
Kay [illegible]	freelance	WDC.
[illegible] T. Nevins	[illegible] City of Newark Div. of Eng.	94 William Street
[illegible] Turetsky	self	Andover
[illegible]	–	[illegible]
Michael Gordon	Attorney – HRHC	West [illegible]
Jane McCarter	LAWYER - McCarter + English	
Maria Del Tufo	freelance [illegible]	1121 Burnet Ave. Union N.J.
KATHRYN SOVA	ESSEX COUNTY OFFICE OF THE COUNTY EXECUTIVE	HALL OF RECORDS NEWARK, NJ
TAMMY FRANTZ	CNN	5 PENN PLAZA NYC
KEN SULLIVAN	IT	165 Fieldcrest Ave Edison
BIANCA COSTA		[illegible] ILL ST. NWK

NAME	AFFILIATION	ADDRESS
14. Walter Archer	Garden + Garden	80 Main St W. Orange
15. Carl F. [illegible]	Resident	25 Esther St
16. [illegible]		31 Clark ST
17. Anna Kazmierczyk		124 Main St
18. Anna Miller		101 St. Charles St
19. LOUIS A. TURCO	(REPRESENTING COUNCILWOMAN MARIE VILLANI)	237 ADAMS ST NEWARK
20. CESAR MUÑOZ		284 EAST KINNEY
21. Victor De Luca		38 MAIN ST. NWK
22. Maharmia Cruz		20 Lexington St
23. Antoinette [illegible]		[illegible] Albert Ave
24. [illegible]		1?? Albert Ave
25. D.M. O'Shea		10 W Orange Ave S. San Francisco, CA
26. Rena Kopystenski	ACNJ	PO Box 233 Englishtown
27. Peter Montague		PO Box 3541 Princeton NJ 08543
28. John Dirt		10 ORANGE ST [illegible]
29.		
30.		

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
HAZARDOUS SITE MITIGATION ADMINISTRATION
PUBLIC HEARING TO RECEIVE COMMENT

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7:00 p.m.
ST. ALOYSIUS THEATER
89 FLEMING AVENUE
NEWARK, NJ

NAME	AFFILIATION	ADDRESS
[illegible] Brasfield	NJ [illegible]	[illegible] Agriculture [illegible] Trenton
[illegible] SWALES	NEWARK OEM	35 MANOR DR NWK
[illegible] L ZACH	LIFE OF RIVER	CITY OF NEWARK
BOB PENN	NEWARK OEM	35 MANOR DR NWK
[illegible] McDonough	Conrail ENV. ENG	25 Commerce Drive
[illegible] Mannina	30 Oxford St	Newark NJ [illegible]
[illegible]	93 [illegible] St. NWK	OFFICE OF INTER- GOVERNMENTAL AFFAIRS
Frances [illegible]	103 [illegible] St	103 [illegible] Newark NJ
M [illegible]	[illegible] Joseph St	

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
HAZARDOUS SITE MITIGATION ADMINISTRATION
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7:00 p.m.
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89 FLEMING AVENUE
NEWARK, NJ

NAME	AFFILIATION	ADDRESS
DIANNA KOCUREK	TISCHLER/KOCUREK	ROUND ROCK, TX
LIAL TISCHLER	TISCHLER/KOCUREK	ROUND ROCK TX
Larry Custer	Lummus Crest	Bloomfield NJ

ATTACHMENT C

Speakers at the 2/20/86 Diamond Shamrock Public Hearing

Mr. Dennis G. Cherot, Director, Newark Department of Health and Welfare

Mr. Henry Martinez, Councilman, City of Newark

Mr. Alvin Zach, Director, Newark Department of Engineering

Ms. Kathryn Sova, for Essex County Executive Peter Shapiro

Mr. Michael Gordon, Attorney, Ironbound Committee Against Toxics

Mr. Arnold Cohen, Ironbound Committee Against Toxics

Mr. Victor DeLuca, Administrator, Ironbound Community Corporation

Ms. Rena Kopystenski, Executive Director, Agent Orange Victims of New Jersey

Mr. Peter Montague, Consultant

Ms. June Kruszewski, Ironbound Committee Against Toxics

Ms. Sandra King, Reporter, New Jersey Network News

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ATTACHMENT D

Newark

Kenneth A. Gibson
Mayor

Department of Engineering

920 Broad Street
Newark, New Jersey 07102
201 733-8420

Alvin L. Zach, P.E.; L.S.
Director

E

February 21, 1986

Mr. Michael F. Catania
Deputy Commissioner
N.J. Dept. of Environmental Protection
CN 402
Trenton, New Jersey 08625

RE: Public Hearing - Feasibility Study For Final Remediation of the Dioxin Contamination at 80 Lister Avenue

Dear Mr. Catania:

As a follow up to my testimony last night, concerning the above, I received a letter this morning from West Germany's Department of Environmental Protection, dated February 18, 1986 (copy attached), in response to my cablegram of January 29, 1986. The letter indicates that there is a registered landfill for dioxin contaminated debris in Kassel West Germany.

I would urge that you move to require that Diamond Shamrock realistically assess not only this noted West German disposal site, but, also other international disposal sites that are properly designed and constructed to properly dispose of such debris.

The tipping fee at Kassel is DM 211 per metric tonne, which translates at today's exchange of $91.15 per metric ton of waste that would be landfilled.

Please advise me, at your earliest possible convenience, what steps you plan to [illegible] the proper disposal at [illegible]

An early response would be most appreciated.

Very truly yours,

Alvin L. Zach, P.E., Director
Department of Engineering

ALZ:as

CC: Kenneth A. Gibson, Mayor
Henry Martinez, Councilman, East Ward
Elton Hill, Business Administrator
Richard Dewelling, DEP, Commissioner

CHW
CITIZEN'S CLEARINGHOUSE FOR HAZARDOUS WASTES, INC.
POST OFFICE BOX 926, ARLINGTON, VIRGINIA 22216
(703) 276-7070

March 4, 1986

Ms. Grace Singer
New Jersey Department of Environmental
Protection
Hazardous Mitigation Administration
CN 028
Trenton, NJ 08625

Dear Ms. Singer:

The Citizens Clearinghouse is a national grassroots organization that works with community groups across the country concerned with problems caused by hazardous and toxic chemicals. We are concerned and troubled by the plan proposed by Diamond Shamrock to clean up soils contaminated with dioxins in the Ironbound neighborhood of Newark. As we understand the cleanup plan, Diamond Shamrock proposes to place dioxin laden soils in a landfill on their property in this area.

Given the growing scientific evidence documenting the failures of landfills, we are surprised and disappointed that DEP is even considering this as an alternative.

We would expect that DEP is familiar with studies conducted at both Princeton University and Texas A & M Universities, as well as reports prepared by the Congressional Office of Technology Assessment and the National Academy of Sciences (see attached reference list). These studies and others have come to the same general conclusion: all landfills will eventually fail. The National Academy Report further stated that landfilling should only be considered as "the last alternative after all waste treatment technologies...have been explored." Have all other treatment technologies been considered here?

Landfills built with even the best available engineering design are still destined to fail. It is only a matter of time. Permitting Diamond Shamrock to landfill these wastes in a community is only asking for trouble. The only advantage to the plan seems to be a cheap and convenient way for Diamond Shamrock to dispose of these wastes. This is not in the best interest of the local community. DEP's first priority should be to provide maximum protection of public health and the environment and not make life "easy" for industry.

We hope DEP will NOT apporove this proposed plan, but rather consider cleanup options that will more permanently destroy or detoxify the dioxin laden soils. Landfilling the wastes is not a solution. It would be a mistake.

Thank you for consideration of these comments.

Sincerely,

Stephen U Lester

Stephen U. Lester
Science Director

Lois Marie Gibbs

Lois Marie Gibbs
Executive Director

SUL:LMG/gfm

STUDIES DOCUMENTING FAILURES OF LANDFILLS

1) Technologies and Management Strategies for Hazardous Waste Control. Congress of the United States, Office of Technology Assessment, Washington, D.C., March, 1983.

2) Management of Hazardous Industrial Wastes, Research and Development Needs. National Materials Advisory Board, National Research Council of the National Academy of Sciences, March, 1983.

3) William Sanjour, U.S. EPA and Kirk W. Brown, Texas A & M University Testimony before the House Subcommittee on Natural Resources, Agriculture Research and Environment of the Committee on Science and Technology. November 30, 1982. (Comments on EPA proposed regulations for the land disposal of hazardous wastes).

4) Alternatives to the Land Disposal of Hazardous Wastes. An Assessment for California. Prepared by the Toxic Waste Assessment Group, Governor's Office of Appropriate Technology, State of California, 1981. Available from Publications and Information, OAT, 1600 Ninth St., Sacramento, CA 95814. Phone: 916/323-8133.

5) Hazardous Waste Landfills - Can Clay Liners Prevent Migration of Toxic Leachate? Allen Morrison. Civil Engineering - ASCE. July, 1981.

6) Organic Leachate Effects on the Permeability of Clay Liners. D.C. Anderson, K.W. Brown, J.D. Green appeared in the proceedings of the National Confer- ence on Management of Uncontrolled Hazardous Waste Sites. October 28-30, 1981.

7) The Interaction of Clay-Soil with Water and Organic Solvents: Implications for the Disposal of Hazardous ~~Wastes.~~ ~~William J.~~ Green, ~~S. Fred Lee and~~ R. Anne Jones. Accepted for publication J. Env. Sci. and Techn. 1982.

8) Performance Difficulties of "Secure" Landfills for chemical Waste and Available Mitigation Measures. Peter N. Skinner; Appeared in The Hazardous Waste Dilemma: Issues and Solutions. 1980 Conference of Environmental Engineering Division of the American Society of Civil Engineers, 1981.

9) Four Secure Landfills in New Jersey--A Study of the State of the Art in Shallow Burial Waste Disposal Technology, Draft of February 1, 1981. Dr. Peter Montague, Dept. of Chemical Engineering and Center for Energy and Env. Studies, Sch. of Eng./Applied Sci., Princeton Univ., Princton, N.J., 1981.

10) Discussion Paper: State Action to Reduce Land Disposal of Toxic Wastes. Prepared by the Interagency Task Force for Reduction of Land Disposal of Toxic Wastes. State of California, Dept. of Health Services. January, 1982.

11) Hazardous Waste Disposal Methods: Major Problems With Their Use. Report by the Comptroller General of the United States. U.S. General Accounting Office, Report No. CED-81-21. November 19, 1980.

Maria A. Del Tufo, R.T.
CONSULTANT IN ENVIRONMENTAL SERVICES AND OCCUPATIONAL HEALTHCARE

March 12, 1986

Ms. Grace Singer
New Jersey Department of Environmental Protection
Hazardous Site Mitigation Administration
Office of Community Relations
CN 028
Trenton, New Jersey 08625

Dear Ms. Singer,

As an environmentalist and someone with family concerns in the Ironbound communityof Newark, I would like to take this opportunity to comment on the Feasibility Study done by Diamond Shamrock Corp. with regard to the "Clean-up" and/or remediation of contaminants at 80 and 120 Lister Avenue, Newark.

It was my understanding at the Public Hearing held on this subject on February 20, 1986, that excavation and off-site transportation and disposal of the dioxin contaminated materials is NOT an alternative since;

1. Dioxin is not accepted at any established out-of-state landfill in this country from an out-of-state source, and
2. Excavation of said contaminants would innately produce "more" air pollution and contamination of the environment.

As outlined in the FACT SHEET on the Feasibility Study for 80 and 120 Lister Avenue, Newark, N.J., I fundamentally agree with the sixth Remedial Alternative considered:

> "Excavation, loading and transportation of contaminated on-site materials and off-site commercial disposal, if available; a slurry wall built for stability and ground water control during excavation, and mitigation of migration of remaining dioxin below the 7 ppb level after remediation."

Since the decisions made here will be an accomodation of existing law for any of the alternatives, it seems to me perhaps an "arrangement" could be made between the (NJ)DEP and (FEDERAL)EPA to have already established "Dioxin-Qualified" out-of-state landfills accept our dioxin waste, at least temporarily until New Jersey has it's own such facility.

1121 BURNET AVENUE UNION, NEW JERSEY 07083 201-851-9470

As for the excavation further contaminating the environment, we both know there are ways and means to excavate safely and without further contaminating the surrounding air, water and land, however costly to Diamond Shamrock.

I thank you for this opportunity to comment on this situation and hope you can arrive at a remedial alternative that is agreeable to all concerned.

If I can be of help in any way, please feel free to contact me.

Yours truly,

Maria Del Tufo

Maria A. Del Tufo, R.T.

cc: Councilman Henry Martinez
East Ward, Newark, N.J.

C-0486

KENNETH A. GIBSON
MAYOR
NEWARK, NEW JERSEY
07102

March 18, 1986

Honorable Richard T. Dewling
Commissioner
N. J. Department of Environmental
Protection
CN 402
Trenton, New Jersey 08625

Dear Commissioner Dewling:

In addition to exploring the use of registered sites outside of the United States for the safe and proper storage of the dioxin contaminated waste as noted in Mr. Zach's letter to Mr. Catania of February 21, 1986 (copy attached), I would like to suggest that you require Diamond Shamrock to explore the use of EPA's first registered disposal site for dioxin in the United States. The J. M. Huber Corporation has recently been permitted by EPA for dioxin disposal in Texas. I am attaching a copy of ten articles printed in the March issue of "World Waste," which describes the dioxin disposal process.

In that disposal facilities are available, the dioxin from the Diamond Shamrock property and other contaminated sites in Newark should not be permitted to be stored in Newark.

Sincerely,

Kenneth A. Gibson
Mayor

KAG:pa

Attachments

cc: Mr. Alvin L. Zach, P.E., L.S., Director, Newark Dept. of Engineering
Honorable Michael F. Catania, Deputy Commissioner, N. J. Dept. of Environmental Protection

Newark

9341
80

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736-0094
AREA CODE 201

March 18, 1985

RECEIVED
MAR 19 1986
OFFICE OF REGULATORY SERVICES
DEPT. ENVIRON. PROTECTION

Gerard Burke, Esq.
Director of Regulatory Services
State of New Jersey
Department of Environmental Protection
Office of Regulatory Services
CN-402
Trenton, New Jersey 08625

RE: Diamond Shamrock Feasibility
Study Comments

Dear Mr. Burke:

The following comments are submitted on behalf of the Ironbound Health Rights Advisory Commission and Arnold Cohen. These written comments are in addition and adopt the oral comments made by myself, Dr. Peter Montague and Arnold Cohen at the public meeting held by DEP on the feasibility study.

The main areas of concern and deficiencies found in the feasibility study are the following:

1. Diamond has failed to comply with 7:25-1.4 by not exploring all alternatives and failing to list detailed reasons why off-site disposal is not available.

2. Diamond has failed to fulfill its obligation to furnish

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communications regarding the availability of off-site options for disposal. This prevents a meaningful evaluation of available alternatives remember DEP specifically requested this information be contained in the study in August of 1985.

3. Diamond has failed to evaluate the legal requirements applied by DEP to site cleanups in N.J. This prevents the evaluation of what laws will be broken by the cleanup option selected by Diamond.

4. Diamond has failed to evaluate the impacts of Judge Stanton's order and opinion (copies atached). These require that the cleanup achieve the highest level of cleanup that the boundaries of our known technology would allow.

5. Diamond has failed to evaluate the impacts of known cleanup and construction methodologies upon the options requiring excavation of materials, ie. reverse pressure within a covered work area. This means the evaluation of alterntives presented is clearly misleading. Diamond relies on this misinformation to eliminate any options containing excavation of soils.

6. Diamond has failed to properly evaluate the impact upon the environment and public health of abandonment of the site by Diamond once the 30 year time frame of maintenance of the site envisioned by Diamond's feasbility study ends. This failure is critical for New Jersey law requires remedial activity until the site has been cleaned and responsibility for ongoing cleanup

activity is not ended by the mere passage of time.

7. Diamond has improperly developed a groundwater decontamination program based upon the chemical characteristics of two compounds when we know literally a hundred compounds are contaminating the site. The likelihood of success of any groundwater program must evaluate the mobility, toxicity, etc. of all compounds present above the New Jersey standard of 10 ppb being used for ground water cleanups at industrial sites. The feasibility study does not recognize the proper cleanup goal of remediation until all contaminants are below the 10 ppb. standard.

8. Diamond has failed to evaluate the impact of flooding upon the project and the proposed use of this area for flood control by the Army Corps.

9. Diamond has failed to evaluate the New Jersey requirements for thickness and permeability as to liners at new waste disposal locations. Diamond's reliance on the present silt layer is illegal.

10. Diamond has not evaluated the siting, permitting construction operation, and maintenance of a new Diamond dioxin disposal facility, within New Jersey or anywhere else in the world.

11. Diamond has not evaluated the disposal of dioxin contaminated soil at licensed international disposal sites.

12. Diamond has not evaluated the current Passaic River dioxin and DDT contamination and how that relates to moving forward with this recommended alternative.

13. The recommended alternative does not evaluate the cost and legal constraints of seeking to become a licensed permitted solid waste or hazardous waste disposal facility within New Jersey. This is what is being recommended by Diamond.

The Ironbound Health Advisory Commission is adament that the objectives outlined by Diamond in its executive summary are illegal in part and do not meet the cleanup requirements as mandated by the judicial decision of Judge Stanton. Judge Stanton has determined that Diamond Shamrock is legally responsible to cleanup these sites to the extent permitted by known technology. This does not mean merely contain conntaminants on site, or merely reduce the mass transport of DDT and Dioxin in the ground water, or merely eliminate the mass transport of chemicals from the site to the Passaic River, or mean undue concern for the most cost effective method when that method does not represent a total cleanup. Judge Stanton's ruling means the implementation of cleanup and removal to a secure facility and the commentors will pursue this interpretation in court if necessary in order to prevail upon DEP to require a real cleanup. Diamond's current study is incomplete and the Ironbound Health Rights Advisory Commission requests a formal hearing be held by DEP once the feasibility study has been deemed complete and DEP has selected an alternative and issued its rationale necessary to support it.

Respectfully submitted,

Michael Gordon

MICHAEL GORDON

MG:pc
Enclosure

cc: Arnold Cohen

SUPERIOR COURT OF NEW JERSEY

Reginald Stanton
Assignment Judge

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MORRIS AND SUSSEX COUNTIES

February 3, 1986

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Re: Ironbound Health Rights Advisory Commission, et al. v. Diamond Shamrock Chemicals Co., et al.:

Chancery Division, Essex County;
Docket No. C-3190-83E -- LETTER OPINION

Dear Counsel:

On January 8, 1986, an Order Granting Final Equitable Relief and Transferring Damage Claims to Law Division was entered by me in this action. The Order acted as a final judgment with respect to plaintiffs' claims for equitable relief. On February 24, 1986, I received notice that the defendants New Jersey Department of Environmental Protection and New Jersey Department of Health appeal from a portion of the Order. This Letter Opinion is issued pursuant to R. 2:5-1(b) and must be made part of the record on appeal.

Over a period of years, the defendant Diamond Shamrock Chemical Company, or a corporate entity to which it was related, manufactured a chemical herbicide in a factory at 80 Lister Avenue in the Ironbound section of Newark, New Jersey. Under the name "Agent Orange" this herbicide was widely used as a defoliant during the Vietnam War. A by-product of the herbicide is an extremely troublesome dioxin.

Tests on many standard species of laboratory animals have shown that the dioxin involved here is highly toxic. Indeed, for some standard species, the dioxin is super toxic, with extremely small quantities producing quick death. Experience with standard species of test animals would lead one to suspect that exposure to dioxin might produce devastating results in humans.

Before the dioxin in question was perceived as being as potentially dangerous as we now suspect it may be, many human beings were exposed to it in one way or another. Nevertheless, the devastating results for humans which might have been predicted from the test results we now have on laboratory animals do not seem to have occurred. The evidence in this case indicates that most human beings exposed to this dioxin have not yet experienced any adverse results, at least none which can be presently detected. When exposed humans have experienced detectable adverse results, the problems seem to be relatively minor.

It may be that the human organism has an ability to withstand exposure to this dioxin which the standard species of test animals do not share, or it may be that exposed humans have received damage which is slow in manifesting itself. All of us hope, of course, that the dioxin is not seriously harmful to humans.

But our experience with other chemicals forces us to be cautious, because we know that we are sometimes seriously damaged by a chemical without being aware of it until many years have passed after the exposure. In this regard, one cannot help thinking about a synthetic estrogen (DES), an approved therapeutic drug which was routinely administered to many pregnant women to prevent miscarriages. The women taking DES did not appear to be hurt by it, the babies they produced appeared to be healthy, and grew into healthy young children. However, as those children passed through puberty into adolescence, vastly disproportionate numbers of them developed serious cancers. The human reality and the human decency of our present situation require us to regard persons exposed to dioxin as being at special risk. They will remain at special risk for many years to come. It is imperative that responsible public agencies operate carefully designed programs to test, monitor and, if necessary, treat persons exposed to dioxin.

Many years ago, defendant Diamond Shamrock Chemical Company used the factory at 80 Lister Avenue to manufacture herbicide. All of the persons who worked in the factory during that manufacturing process were exposed in a substantial way to dioxin. The families of those workers were exposed to the dioxin in a different, but potentially significant, way. After Diamond Shamrock stopped using the factory at 80 Lister Avenue, other businesses used the premises for different manufacturing processes. By that time there were relatively large amounts of dioxin in the soil and materials at 80 Lister Avenue, and these workers were exposed. Their families have had a derivative exposure to dioxin. Over the years, dioxin has been carried from 80 Lister Avenue into the surrounding neighborhood. Neighborhood factory workers and residents have been exposed to varying amounts of dioxin. In short, over the years, various categories of persons have been exposed in different ways, for different lengths of time, to varying amounts of dioxin. On the face of it, some of the exposure is potentially very dangerous, some is potentially moderately dangerous in some degree or other, and some is probably not dangerous. But nobody really knows.

The fact that there was substantial dioxin contamination at 80 Lister Avenue and its environs came to public attention in 1982. Shortly thereafter, this action was instituted. Plaintiffs have sought a wide range of injunctive relief. Some of the relief was aimed at physical cleaning of 80 Lister Avenue and surrounding areas; some of it was aimed at identifying, testing, monitoring and treating the various categories of persons exposed to the dioxin. There were also claims for substantial money damages. At the outset, I determined (without any serious objection from any of the parties or their attorneys) that top priority had to be given to physical abatement and cleaning of the environment and to helping to get appropriate health programs in place. Financial liability problems were of decidedly secondary importance. I did not want to see the energy and resources of public officials and the parties diverted from the need to solve existing environmental and health problems. Accordingly, I stayed all proceedings with respect to damage claims, and I prohibited any discovery on the damage claims.

Although we have never had and never will have a plenary trial on the equitable relief claims in this case, we have had extensive interlocutory proceedings dealing with the equitable relief claims. There have been many fortunate aspects to this case. The executive branch of our State government has given extensive attention to the problems at and around 80 Lister Avenue. The attention has often been at the highest level, with the Commissioner of Health, the Commissioner of the Department of Environmental Protection and the Governor himself becoming personally involved in some of the executive branch decision-making. Diamond Shamrock has exhibited an enlightened social conscience with respect to the environmental problems and has entered into consent administrative orders with the Department of Environmental Protection which have committed many millions of dollars and considerable technical expertise to the removal of dioxin from 80 Lister Avenue and its environs.

In particular, there have been fairly extensive interlocutory proceedings with respect to health issues. We have never had oral testimony on the health issues, but we have had extensive expert testimony by way of affidavits and reports. Mostly as a result of its own initiatives, but partly as a result of prodding in this action, the New Jersey Department of Health produced an elaborate plan to test and monitor in different ways the various categories of exposed persons. (Federal health agencies apparently played a large role in developing that plan, but the New Jersey Commissioner of Health approved the plan and authorized its submission to this Court as his plan to deal with the health needs of the situation.) The Department of Health plan was not acceptable to plaintiffs, but after hearing the arguments of the parties and reviewing their extensive documentary submissions, I decided that the plan submitted by the State was an adequate program for dealing with the health issues. Accordingly, I entered an Order approving the plan some time ago.

By the summer of 1985, it appeared to me that the Department of Environmental Protection and the Department of Health had the real-life problems of this case well in hand. That is not to say that the problems were solved. Far from it. Many future years pf work are involved here. The environmental cleanup plan and the health plan will require ongoing revision and updating as work progresses and as more facts become known. However, it seemed to me that the Commissioner of the Department of Environmental Protection and the Commissioner of the Department of Health were addressing all of the problems with vigor and with expertise that the Court did not possess. Accordingly, I suggested to the parties that perhaps the Court should terminate the equitable relief portion of the case and transfer the damage claims to the Law Division for further proceedings. I invited the parties to submit written argument. After receiving the arguments of the parties, I entered the January 8, 1986 Order Granting Final Equitable Relief and Transferring Damage Claims to the Law Division.

So far as equitable relief claims are concerned, the January 8 Order provides as follows:

> "IT IS FURTHER ORDERED that the Commissioner of Department of Health shall implement (with federal technical assistance and financial aid, if available; but without them, if they are not available) the medical testing and monitoring program previously approved by the Court, and the Commissioner of Department of Environmental Protection shall continue to enforce the cleanup of dioxin contamination at an(d) in the environs of 80 Lister Avenue, Newark, New Jersey to the greatest extent feasible within the bounds of known technology. ...
>
> "The Court is satisfied that the Commissioner of the Department of Health and the Commissioner of the Department of Environmental Protection will continue in an active and vigorous fashion to discharge their responsibilities in this matter. Other than what is granted above, no additional equitable judicial relief is necessary. This Order constitutes a final judgment on the claims asserted herein for equitable relief."

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I realize that when the Commissioner of the Department of Health submitted his testing and monitoring plan to the Court he anticipated that substantial financial and technical assistance in carrying out the plan would be forthcoming from the federal government. I gather that federal funding has not yet been obtained in anything approaching the needed amount, and that it is doubtful that full federal funding will ever be granted. That lack of federal funding is regrettable, and I recognize it poses substantial practical problems for the New Jersey Department of Health. However, the lack of federal funding does not alter the basic realities of this case, and it does not and should not relieve any New Jersey official of his responsibilities in this matter.

Perhaps the most basic reality of this case is that there is a fundamental human need to be met. Real people, innocent people, whose identities are known, have been exposed to dioxin and put at special risk. They have to be tested, monitored and, if necessary, treated. This is a responsibility of government. In view of the fact that the testing and monitoring may yield data of general scientific significance in addition to helping the individual people involved, one would have hoped that the federal government would be a major funder. However,if the federal government is unwilling or unable to help, that does not excuse New Jersey from meeting its responsibility. We in New Jersey have our own special traditions of caring, concern and decency, and they must be upheld.

The Commissioner of the Department of Health has appealed from that portion of the January 8 Order which requires him to "implement (with federal technical assistance and financial aid, if available; but without them, if they are not available) the medical testing and monitoring program previously approved by the Court. ..." I point out that the program in question was not something proposed by the plaintiffs, or even fully acceptable to them. It was not something devised by the Court. The program was proposed to the Court by the Commissioner. It represented his evaluation of what needed to be done to meet the human health needs of this situation. I accepted it because it appeared to be a well-designed, well-reasoned response to the health problem confronting all of us. The hoped-for federal funding may have disappeared, but the problem has not. Given the importance of the problem, I do not think it represents inappropriate judicial activism or an inapproriate judicial intrusion into the affairs of the other branches of government to require the Commissioner of the Department of Health to implement his own program of medical testing and monitoring, even though he did not get the federal help he anticipated. Under all of the circumstances of this case, I think it is right for the Court to expect the Governor and the Legislature to figure out a way to provide the several million dollars needed to implement the medical testing and monitoring program.

Very truly yours,

Reginald Stanton, A.J.S.C.

Copies to:
- Clerk of the Appellate Division (5 copies)
- Case file

FILED
JAN 08 1986
Reginald Stanton, A.J.S.C.

Prepared by the Court after
receiving draft Order from
plaintiffs' attorneys

IRONBOUND HEALTH RIGHTS
ADVISORY COMMISSION, et al.,

Plaintiffs

-v-

DIAMOND SHAMROCK CHEMICAL
COMPANY, et al.,

Defendants.

SUPERIOR COURT OF NEW JERSEY
CHANCERY DIVISION
ESSEX COUNTY
DOCKET NO. C-3190-83E

Civil Action

ORDER GRANTING FINAL EQUITABLE
RELIEF AND TRANSFERRING DAMAGE
CLAIMS TO LAW DIVISION

This matter came before the Court on the motion of Gordon and Gordon, P.A., attorneys for plaintiffs, for an Order for Additional Interim relief in the presence of Messrs. Gordon and Gordon, P.A. by: Michael Gordon, Esq. and Timothy S. Haley, Esq., Attorneys for Plaintiffs; Messrs. Hoagland, Longo, Oropello & Moran, by: Rhonda S. Birnbaum, Esquire, Attorneys for Defendant, Aetna Casualty; Messrs. Lowenstein, Sandler, Brochin, Kohl, Fisher, Boyland & Meanor, by: Philip L. Guarino, Esq., Attorneys for Defendant, S.E.A. Services, Inc., Messrs. McCarter & English, by: Francis E.P. McCarter, Esquire, Attorneys for Defendant, Diamond Shamrock Chemicals Company; Messrs. Shanley & Fisher, by: Kenneth S. Kasper, Esquire, Attorneys for Defendant, Richard F. Engel, Esquire, Deputy Attorney General, Attorney for Defendant, Department of Environmental Protection; Messrs. Dughi & Hewit, by: Patricia Massa Bass, Esquire, Attorneys for Defendant, Dr. Roger Brodkin. The question of making final the equitable relief granted in this case came before the Court on its own motion, after all counsel were given the oppportunity to comment thereon.

IT IS HEREBY ORDERED, on this 8 day of January, 1986, that Plaintiffs' Motion for Additional Interim Relief is denied.

IT IS FURTHER ORDERED that the Commissioner of Department of Health shall implement (with federal technical assistance and financial aid, if available; but without them, if they are not available) the medical testing and monitoring program previously approved by the Court, and the Commissioner of Department of Environmental Protection shall continue to enforce the cleanup of dioxin contamination at an in the environs of 80 Lister Avenue, Newark, New Jersey to the greatest extent feasible within the bounds of known technology. See below. *

IT IS FURTHER ORDERED that the matter is hereby transferred to the Law Division, Essex County for all further proceedings on the damage claims asserted herein.

IT IS FURTHER ORDERED that the stay on discovery is hereby lifted.

It is recommended to the Honorable John A. Marzulli, A.J.S.C. that this matter be specially assigned to a single judge for case management.

Plaintiffs' attorneys shall send copies of this Order to all counsel of record within 7 days of the date hereof.

REGINALD STANTON
Judge of the Superior Court
Assignment Judge

* The Court is satisfied that the Commissioner of the Department of Health and the Commissioner of the Department of Environmental Protection will continue in an active and vigorous fashion to discharge their responsibilities in this matter. Other than what is granted above, no additional equitable judicial relief is necessary. This Order constitutes a final judgment on the claims asserted herein for equitable relief.

A.J.S.C.

CONFORMED COPY

Appendix A - Part II

Diamond Shamrock Site
80 and 120 Lister Avenue
Newark, Essex County
New Jersey

Responsiveness Summary for the Proposed Interim Remedial Action Plan

August 1987

DIAMOND SHAMROCK SITE

RESPONSIVENESS SUMMARY
FOR THE
PROPOSED INTERIM
REMEDIAL PLAN

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RESPONSIVENESS SUMMARY

PROPOSED INTERIM REMEDIAL ACTION PLAN FOR THE DIAMOND SHAMROCK SUPERFUND SITE NEWARK, NEW JERSEY

PUBLIC COMMENT PERIOD
July 31, 1987 to August 31, 1987

Sections I and II below present a summary of the questions and comments expressed by the public at the August 11, 1987, meeting on the Proposed Interim Remedial Action Plan for the Diamond Shamrock Superfund site. The questions and comments are grouped into general categories or subjects. Section III is a summary of additional comments received in writing during the public comment period. All comments or questions are followed by responses representing the joint position of EPA and NJDEP.

I. Selection of a Remedial Alternative

A. The Proposed Interim Remedy - On-site containment with ground-water pumping and treatment.

1. **Community members stated concern that this "interim" solution would be permanent and that the site would become a hazardous waste disposal facility.**

EPA and NJDEP do not believe that the proposed remedy will be a permanent solution for the contamination at the Diamond Shamrock site. It is hoped that future studies of the means for excavation will show that excavation can be done in a safe manner with an acceptable impact on the community. Both Agencies believe that siting problems for a hazardous waste thermal treatment unit can be resolved, given enough time. It is expected that that larger thermal treatment units capable of properly treating dioxin wastes will be proven effective and will become available for the treatment of waste from this site. This expectation is based on the rapid progress in thermal treatment technology which is currently being made.

Excavation and treatment options are not preferred at this time, in part, because they cannot be implemented in an expeditious manner. Once the site is adequately controlled by the proposed remedy, however, the need to remedy the site expeditiously will no longer exist and more complex remedies such as excavation and thermal treatment can be considered in the necessary detail.

2. Peter Montague expressed concern about whether a remedy similar to that proposed had been used on similar wastes. If so, where has this solution been used before?

Containment remedies have been utilized at hazardous waste sites numerous times in the past, although the composition of the waste, especially with respect to the dioxin contamination, at the Diamond Shamrock site is unique. A noteworthy example of the successful implementation of containment at a site with wastes similar to those at Diamond Shamrock is the Love Canal site in New York State. As with Diamond Shamrock, Love Canal is a setting in which pesticides and dioxin-contaminated materials were disposed.

A new cap was placed on the Love Canal site in 1984 and ground-water pumping and treatment have been initiated. Extensive monitoring has subsequently been conducted and the results indicate the effectiveness of the cap and ground-water pumping and treatment in controlling off-site migration of contaminants.

3. Frank Sudol, representing Mayor Sharpe James, said that the proposed remedy does not adequately address the following:

a - detailed description of the FS to be conducted every two years (what will be done to meet CERCLA 121(c)?);

The Agency is currently developing guidance that will explain procedures for conducting evaluations required by Section 121(c). After this guidance is available, it will be used in developing plans for the biennial Feasibility Studies called for by the Proposed Plan. Existing EPA guidance for conducting a Feasibility Study, entitled Guidance on Feasibility Studies under CERCLA, June 1985, provides much information that will still be relevant when the first re-evaluation is performed.

b - detailed proposal for public participation in the biennial FS;

Current EPA regulations require that there be a public comment period on all Feasibility Studies developed under the Superfund program. Therefore, the public will have an opportunity to review and comment on each biennial re-evaluation report. Additionally, NJDEP and EPA will be willing to meet with an advisory committee composed of officials and community representatives in order to obtain input from this committee and to keep the committee apprised of site status.

c - details concerning the conditions which would trigger additional studies;

Since re-evaluation studies are to be completed every two years, such studies will be in progress almost continually. NJDEP and EPA, therefore, do not anticipate the need for additional studies. The Agencies have the discretion, however, to conduct or require such studies should the need arise.

d - the possibility of Newark receiving compensation for accepting dioxin, as there is a precedent for this;

EPA and NJDEP are aware of no existing statutory authority to compensate Newark for storing dioxin. Thus, the Agencies cannot consider compensation at this time.

e - detailed proposal for air monitoring;

Item 14 on page A-2 of the Proposed Interim Remedial Action Plan (the Proposed Plan) addresses the need for suitable monitoring activities: "Implement suitable monitoring, contingency, operation and maintenance... to ensure the protection of human health and the environment during and after the installation of the selected alternative, including a ground water monitoring program." Detailed plans for this monitoring will be included in the Remedial Design document, including specific actions for air monitoring. That document will be made available for public review and comment, prior to the initiation of any on-site work.

f - details concerning how the carbon will be treated after it has cleansed the ground water;

Item 13 on page A-1 of the Proposed Plan specifies how the spent carbon and other sludges generated by wastewater treatment will be handled. It states that actions taken as part of the remedy will "place on-site and cap the sludge generated from the wastewater treatment process until such time that an alternative method of sludge management is approved." Spent carbon and sludges will probably be placed in a separate on-site landfill cell to minimize potential release of other on-site waste under the cap. Future options for these ground-water treatment wastes may involve treatment at an off-site permitted facility.

g - plan for a bulkhead which could withstand the 500-year flood;

The securing of the hazardous materials from flooding will not be achieved solely by rebuilding the bulkhead. The integrity of the site will also be maintained by the construction of the cap, which will be designed to meet the rigorous requirements of RCRA. We anticipate that the cap will be several feet thick and will contain highly impermeable materials which will not be penetrated by flooding or other weather conditions. Although it is possible that the outermost part of the cap may be damaged in the 500-year flood, the contents under the cap would not be threatened. The 100-year flood is used as the design basis for flood protection in a number of applicable Federal and State regulations.

h - plans for additional security during the times when the site will be unattended;

Item 14 on page A-2 of the Proposed Plan addresses the need for "site security measures to ensure the protection of human health and the environment during and after the installation of the selected alternative..." The site will be especially hazardous during implementation of the remedy and there will be much construction equipment on the site. Security measures, therefore, will be quite stringent during the implementation phase. Following completion of the selected remedy, the site will be much less hazardous to trespassers than is currently the case, and the site will need less security. A detailed plan will be prepared later as part of the Remedial Design. The security plan will be available for review and comment by local citizens and officials.

i - details concerning the specific type of industry which might use the site once it is capped;

Although the Feasibility Study explored the possibility, EPA and NJDEP have no intention that industry should be located at this site. Building on the cap would interfere with further remediation.

j - details concerning the contents of the 570 drums mentioned in the FS;

Details concerning the contents of these drums are located in Section 5.10 of the document entitled "Site

Evaluation for 80 Lister Avenue," dated February 1985. This document may be found in the administrative record* for the site. Information currently available indicates that more than half of the drums contain dioxin, which makes off-site disposal of most drums impossible at this time.

k - details on the Feasibility Study plans for dust control, as well as air, ground-water and meteorological monitoring while the buildings are being demolished.

EPA and NJDEP agree that air, water and meteorological monitoring are necessary. These detailed plans will be developed during the Remedial Design phase and will be made available for public review and comment prior to the initiation of on-site work. EPA and NJDEP are confident that this work can be done safely. Possible approaches for dust control would include removal of contaminants whenever possible prior to dismantling buildings, use of chemical dust suppressants and use of a fabric fence around the site.

4. **Several of those who spoke said they believed that the proposed remedy was chosen because it is cheapest or easiest for Diamond Shamrock to implement.**

The reasons for proposing this remedy are outlined in the Proposed Plan. After careful consideration, it was determined by EPA and NJDEP that the proposed remedy is the most protective action available at this time. It was also the most cost-effective. The more costly alternatives had major implementation difficulties which would require a great deal of time, study and effort to resolve (refer to sections B. and C. below for further discussion). The delays this would require are inconsistent with the need to remedy the site in a timely manner.

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*Repositiories for the administrative record are:

United States Environmental Protection Agency
Region II
26 Federal Plaza
New York, NY 10278
(Contact Lenore Berman at 212-264-2649)

New Jersey Department of Environmental Protection
Division of Hazardous Site Mitigation
401 East State Street
Trenton, NJ 08625
(Contact Janice Haveson at 609-984-3081)

Newark Public Library
5 Washington Street
Newark, NJ 07101
(NJ Reference Section, 201-733-7800)

5. **One community member wanted to know the construction materials of the cap.**

The cap is expected to be composed of several layers, including clay, a synthetic membrane liner, a flow zone (containing coarse sand and/or gravel) and a top layer of topsoil and vegetation, as recommended by RCRA guidance documents. Other materials such as a geotextile may also be used to protect areas especially subject to erosion. Detailed plans will be developed in the Remedial Design phase and will be made available for public review and comment. The concrete top layer originally proposed in the Feasibility Study has not been selected because it could unnecessarily interfere with possible further remedial action.

B. Excavation and Thermal Treatment

1. **Mr. Montague expressed concern that incineration was being turned down for insufficient reasons:**

   a - If the lack of a large incinerator is the problem, use several small ones;

   The lack of a large incinerator to treat site waste was, and is, a factor in the decision to recommend the proposed remedy, but it is one of many. The incinerator most successful at burning dioxin-contaminated waste was the EPA mobile incinerator used at the Denny Farm site in Missouri. That unit demonstrated that it can achieve the required 99.9999% destruction and removal efficiency for dioxin. But, the use of a single mobile incinerator like the EPA unit, operating at the rate achieved at Denny Farm (about 12 tons per day), would take about 20 years to burn the amount of waste present at the Diamond Shamrock site. Although a number of these units could be constructed, brought to the site and operated simultaneously, there would be difficulty in locating a large number of small incinerators on a relatively small site. It also would not be cost effective to use small incinerators for a large project. Therefore, it would be preferable to use one or two larger thermal treatment units, although such units have not yet been tested on dioxin waste. Since one or more mobile thermal treatment units may have to be designed, constructed, and tested prior to operation to clean up the Diamond Shamrock site, it is expected to take at least six years to complete this remedy.

b - If airborne releases are a concern, we have clean room technology on a scale large enough to begin the excavation. Mr. Montague also wanted to know why it was all right to risk excavation in Wilsonville, IL, but not in Newark. He asked for a list of communities where excavation has taken place.

Further study is needed to address the concern of airborne releases during excavation. The application of existing technology (e.g., "clean room" or dome technology) at this site would take a great deal of study and method design. There are no precedents for applying these technologies to situations similar to the possible excavation of the Diamond Shamrock site. Clean room technology (i.e., a room under negative pressure, the air exhaust filtered with activated carbon) has been used in a stationary building at the Denny Farm site in Missouri. This building is used for shredding and blending dioxin waste prior to incineration. However, this technology is not designed to be moved around a site being excavated. Although it may be possible to transfer the existing stationary technology to a mobile application at Diamond Shamrock, it would require lengthy study and design to do so.

The chief difference between the excavation being considered for the Diamond Shamrock site and the excavation conducted at Wilsonville, IL, is the level of toxicity of the wastes involved. Dioxin is orders of magnitude more toxic than the substances at Wilsonville. The dioxin contained in air emissions resulting from the excavation of the Diamond Shamrock Site would be the controlling factor in the level of risk. A risk assessment performed for another site with high dioxin concentrations concluded that dioxin-contaminated dusts generated from possible excavation would result in cancer risks greater than 10^{-2} (i.e., one in one hundred) at properties as far away as one-half mile from that site. The calculated risk resulting from high concentrations of other toxic chemicals was negligible compared to the risk from dioxin.

A list of communities where excavation has taken place would require an exhaustive search. Furthermore, a complete list of locations where excavation has been conducted is not germane to the selection of a remedy at the Diamond Shamrock site. Therefore, there are no plans to conduct a search and develop a list at this time. There are, however, numerous examples of excavation, some with dioxin contamination, including Newark, NJ.

c - What are EPA's and NJDEP's reasons for thinking technology will advance to make Alternatives IV, V or VI feasible in the future, as indicated at the top of page 4 of the Proposed Plan?

The section of the Proposed Plan, cited above, states that the implementation problems associated with Alternatives IV, V and VI may be resolved in the future. This resolution is not dependent solely upon technological advancement. Numerous factors, including political decisions, siting, permits or other actions, may help solve problems that have led to the rejection of Alternatives IV, V and VI at the present time. Technology is, however, a significant part of the decision not to select these alternatives.

Prior to the 1985 trial burn of the EPA mobile incinerator at the Denny Farm site, the successful incineration of dioxin waste in accordance with RCRA requirements had not been demonstrated. Since that time, successful trial burns have been conducted by two thermal treatment units developed by the private sector. A number of companies have recently developed mobile incinerators inspired by the success of the EPA unit. Some of these newly developed units have greater capacity than the EPA mobile unit and include modifications intended to improve performance. Recent government initiatives (the land disposal ban regulations being phased in under RCRA and the implementation of the 1986 Superfund Amendments, with its preference for treatment alternatives) should continue to increase the demand for incineration capacity and provide a continued economic incentive for development of new treatment technology. Therefore, thermal treatment technology should continue to progress and to become more available in the future.

2. **One citizen said that the community would oppose on-site incineration.**

At the present time, EPA and NJDEP have no intention of selecting on-site incineration. However, it has not been ruled out for the future. Refer to the response to comment I.C.9. below.

C. Alternative VI - Off-site Treatment or Disposal

1. **Several community members and officials preferred Alternative VI to Alternative III because they feel that the dioxin is being "dumped" in Newark. According to them, the only solution is to move it.**

There are currently no existing permitted facilities at which to dispose of the waste, either in the Unites States or elsewhere. This does not mean that there will be none available in the future. A large factor in the Proposed Plan was the need to find a solution that can be implemented expeditiously; off-site disposal or incineration would take a very long time to develop and implement, during which time the site would continue to present a hazard to public health and the environment.

2. **These people feel that Diamond Shamrock should come and get the waste and store it on some other property owned by the company.**

The difficulties in implementing off-site management options are discussed in other responses in this section. These same difficulties would apply if off-site management were to occur on property owned by Maxus Energy Corporation (successor to Diamond Shamrock). Off-site management options were evaluated and found less protective than the proposed remedy at this time. To limit off-site management options to property owned by one company would make off-site management even more difficult by excluding other properties which may be better suited for managing the waste.

3. **These same people fear that the site will be useless as long as contaminants remain on site.**

EPA and NJDEP do not currently anticipate any use for the site while the proposed remedy is in place.

4. **Two speakers felt that EPA/NJDEP were not really considering the option of sending the dioxin to an off-site location.**

There has been an intensive search for sites in the United States and abroad for a treatment, storage and disposal facility that would accept waste from the Diamond Shamrock site. No promising opportunities at existing facilities have been found. EPA and NJDEP have also looked into constructing a facility primarily for the purposes of receiving site wastes, but have determined that this cannot be accomplished in a timely manner.

5. **Mr. Sudol noted that if the waste were to be transported somewhere, EPA/NJDEP should take transportation risk-reduction measures.**

EPA and NJDEP agree that transportation risk reduction measures should be taken, if such a remedy is selected in the future.

6. **Mr. Montague asked that if Missouri accepts dioxin, why not send the contamination there?**

Missouri has not accepted, and currently does not accept, dioxin wastes from outside the State.

7. **Mr. Sudol cited technical advances in thermal treatment and the fact that EPA did not adequately assess the possibility of shipping to Europe as reasons for revising the Feasibility Study to examine Alternative VI more carefully.**

It is true that there have been significant advances in thermal treatment technology since the Feasibility Study was completed in 1985. These advances were considered by EPA and NJDEP in developing the Proposed Plan. It should be noted that the Record of Decision is based not only on the Feasibility Study, but on the entire administrative record, which includes information that was not available at the time the FS was prepared.

EPA and NJDEP have also explored the option of shipping site wastes abroad. As a result, it has been concluded that shipment of wastes from the Diamond Shamrock site to another country for treatment or disposal has not been demonstrated to be a viable option at this time. No foreign facility which could accept the waste has been identified.

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EPA's Office of International Activities, to which exports of hazardous waste from the United States must be reported, has indicated that dioxin wastes have not previously been exported from the United States. A West German landfill which reportedly has disposed of dioxin wastes and received hazardous wastes from other countries was contacted by IT Corporation and by EPA. Both contacts indicated that approval to dispose of dioxin wastes from the U.S. at this West German facility is very unlikely.

The extreme difficulty in getting approval to export dioxin waste to other countries is illustrated by experiences with Canada, which receives a substantial quantity of hazardous wastes, including Superfund wastes, from the U.S. The Canadian government has opposed containment remedies at U.S. Superfund sites located near the Niagara River, which is a source of Canadian drinking water. One of these sites is Love Canal, which is a dioxin site. A proposal was made by the New York State Department of Environmental Conservation (NYSDEC) to conduct a trial burn for Love Canal waste at an innovative thermal treatment unit (a plasma arc pyrolysis unit) developed and located in Kingston, Ontario, Canada. Despite the fact that a successful trial burn would be a step toward the Canadian government's wish for a permanent solution for the Love Canal site, the Canadian government refused permission for shipment of a relatively small quantity of Love Canal waste to Canada for the trial burn. Canada maintains that if the Love Canal trial burn is conducted, the thermal treatment unit will have to be relocated in the United States. Given this failure to obtain export approval to Canada under relatively promising circumstances, the prospect for approval of export of Newark dioxin wastes does not appear promising at this time.

Should the prospects for export of Newark dioxin wastes change in the future, removal of the waste to another country could be a viable option at that time.

8. Mr. Sudol also said that the fact that there is no licensed facility should not be Newark's problem.

Section 121 of CERCLA requires that short-term risks be taken into account in evaluating remedial alternatives. The fact that there are no licensed off-site facilities which could accept wastes from the site does lessen the effectiveness of off-site treatment or disposal options in controlling short-term risks. Unfortunately, this is one factor which makes the alternative preferred by the City of Newark less protective than the proposed remedy.

9. **Mr. Michael Gordon, Esq., attorney for the Ironbound Health Advisory Commission, stated that off-site incineration is the only alternative which meets Judge Stanton's order.**

It is the position of EPA and NJDEP that the selected remedy meets, for the present, the State's obligation under Judge Stanton's order. Judge Stanton's order requires the cleanup "to the greatest extent feasible within the bounds of known technology." Similarly, Section 121(b) of CERCLA requires the selection of a remedy that uses permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. It is the position of EPA and NJDEP that neither Judge Stanton's order nor Section 121(b) of CERCLA were intended to maximize the use of technology as an end in itself, but as a means for ensuring the protection of health and the environment. Since the alternatives which have a greater reliance on technology are less protective than the Proposed Interim Remedial Action Plan at the present time, the Proposed Plan does utilize known technologies to the extent practicable or feasible for protecting health and the environment.

10. **Mr. Montague asked whether the Proposed Interim Remedial Action Plan adequately outlines the reasons supporting the rejection of Alternative VI.**

The Proposed Plan adequately summarizes the reasons for the remedial selection, including germane reasons for the rejection of Alternative VI. The Record of Decision will provide a more detailed discussion of the selection rationale. Additional supporting information is contained in the administrative record.

II. General Comments and Questions

A. Health

1. **Members of the community urged additional health screening and medical testing. One community member described illnesses occurring in the neighborhood.**

The New Jersey Department of Health did conduct a health survey of Ironbound residents in June 1984. Current health problems or questions that may be related to the Diamond Shamrock site may be brought to the attention of Dr. Liveright at New Jersey Department of Health, Division of Occupational and Environmental Health, at 609-984-1863. The New Jersey Department of Health has expressed a willingness to continue to investigate health problems that may be related to the site, and to assist the Essex County Department of Environmental Health in its efforts.

B. Diamond Shamrock

1. **A number of commentors maintained that Diamond Shamrock is not doing enough to clean up the site.**

Diamond Shamrock has complied with the requirements imposed on it by the State and Federal environmental agencies in addressing site cleanup.

2. **One person was concerned that no penalties had been assessed against Diamond Shamrock.**

The Superfund legislation does not provide EPA with the authority to impose penalties for past actions which resulted in the creation of uncontrolled hazardous waste sites. It does, however, impose financial liability on responsible parties for the costs of the cleanup efforts at Superfund sites. Diamond Shamrock has spent millions of dollars on work it has done to clean up the site and surrounding areas and has reimbursed EPA for almost $2 million of the Agency's costs.

3. **Mr. Sudol stated his belief that violations of ECRA may have occurred when Diamond Shamrock transferred property to a separately incorporated holding company.**

Since ECRA is a State law and falls within State jurisdiction, the matter has been referred to NJDEP for investigation. The alleged ECRA violations, however, are unrelated to the selection of a remedy for the site.

C. Conditions at the Site

1. **A few people questioned what would happen to the 570 drums and the cargo containers. One woman wanted to know the condition of these drums and cargo containers and whether they would be checked before the next Feasibility Study. Another speaker believes that burying the drums will cause new problems.**

The drums and storage containers that remain on the site are inspected on a regular basis. Currently, they are in acceptable condition to prevent releases of containerized materials to the environment. Any drum found to be leaking or whose integrity is otherwise impaired is quickly repaired. Waste from the drums will be stabilized (i.e., the liquids will be solidified) before burial and will not add significantly to the contamination. Those drums which are found not to be dioxin-contaminated will be disposed of off-site.

2. **A few local residents spoke of concern about the guards at the site. One person said that he had gone to the site at various times and had seen no guard.**

The site is visited periodically by NJDEP. To date, a guard has always been found to be on duty. These periodic checks will continue to ensure that the 24-hour security service continues to provide adequate site protection.

3. **One community member said he felt that the cleanup of the Passaic River should not be left unaddressed.**

Contamination in the Passaic River is beyond the stated scope of the Feasibility Study and Proposed Plan for 80 and 120 Lister Avenue. A separate study has commenced and a Feasibility Study will be conducted to determine possible clean up alternatives for the River. A public involvement program will be implemented for that activity to inform the local community of site activities and conditions and provide opportunity for public comment.

4. **Mr. Montague wanted to know exactly what, and how many, chemicals are contaminating the site.**

The list of chemicals identified to be present at the site is extensive. This information can be obtained in the documents "Site Evaluation for 80 Lister Avenue" (February 1985) and "Site Evaluation for 120 Lister Avenue" (May 1985), which are part of the administrative record for this site.

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D. Other Concerns

1. **Mr. Victor DeLuca, from the Ironbound Community Corporation, felt that the response to the need for cleanup in Montclair, NJ was more rapid than the response at Diamond Shamrock and wanted to know why.**

The problem in Montclair, although not without considerable difficulties, is less complicated than the problem at the Diamond Shamrock site. As a result, the solution there should be easier to complete. It should be noted that NJDEP and EPA have responded rapidly to the problems associated with the Diamond Shamrock site and that much has been accomplished since dioxin was discovered in 1983. However, this highly complex situation is not amenable to a quick solution.

2. **City Councilman Martinez expressed his concern that Newark is being penalized for its "not in my backyard" sentiments.**

This was not a consideration in the decision-making process for the site. The available alternatives were evaluated, and the remedy selected, strictly on the basis of site characteristics and technical factors.

3. **Mr. Montague expressed the opinion that the meeting would have been more effective if the sound system and general logistics had been checked beforehand.**

EPA and NJDEP agree that the sound system and the meeting room acoustics were less than desirable. Before reserving the meeting room, the Ironbound Community Citizen's Group was asked its preference for the meeting location. Its preference was the St. Aloysius Theater. Since no complaints had been received at the previous public meeting on this site held in the St. Aloysius Theater, it was assumed that the facilities were acceptable. The Agencies apologize for the noise of the air conditioners.

4. **Mr. Gordon said he believed that EPA/NJDEP had failed to measure the "emotional factor" of the preferred alternative.**

The proposed remedy is the alternative which is most protective of public health and the environment and represents a major improvement over the current situation. If Alternative VI were selected, the emotional response from the public might be more favorable at first. However, the implementation problems associated with Alternative VI would result in later disappointments. The Agencies will continue to stress the advantages of the proposed remedy.

It is hoped that the community will appreciate the positive aspects of the Proposed Plan.

5. **One person expressed the opinion that NJDEP has done nothing to remedy the situation at the site.**

Over the course of the last four years much work was done to remove contamination from the community and place it on the site, where people will not be in contact with it. The proposed remedy will further contain the release of toxic substances into the environment. Since 1983, NJDEP and EPA have made major strides in controlling risks from the site and will continue to do so.

6. **Mr. Montague spoke of his concern that EPA and NJDEP had reasons for the proposed selection of a remedial alternative which are being hidden from the public.**

There are no hidden reasons for selection of the proposed remedy. For example, both the fact sheet distributed at the meeting and the Proposed Plan clearly state that a major disadvantage of Alternative VI is the problem of siting a thermal treatment unit. All reasons for the selection of a remedy at the Diamond Shamrock site are found in the Proposed Plan and will be presented again, in more detail, in the Record of Decision.

III. Summary of Written Comments

The following is a summary of written comments and questions received during the public comment period, July 31, 1987 through August 31, 1987, and the responses to them. Comments given at the public meeting and reiterated in writing have not been repeated here but are addressed in the previous sections.

A. In a letter dated August 31, 1987, Maxus Energy Corporation:

- expressed its concern "about the delay in the approval of a remedial action plan which would enable the closure of the site and elimination of the interim measures."

EPA plans to sign a Record of Decisions for this site, which would constitute formal selection of a remedy, in the very near future. Once a remedy is selected, EPA plans to expedite its implementation.

- urged EPA and NJDEP to revise the proposed timing of the biennial re-evaluation of the remedy from every two years to an "as-needed" basis. The remedy would then be re-evaluated "only if it proves to be ineffective in removing and controlling the movement of contaminants which pose an unacceptable risk to the public..."

CERCLA requires that not only releases, but also the threat of releases, be remediated. Even if the Proposed Plan works soundly, there is still a threat of release which should be examined regularly. Therefore, EPA and NJDEP have no plans to change the requirements of the re-evaluation of the selected remedy every two years.

- stated its belief that the acceptable levels of dioxin at the site should be reviewed. Currently, "an action level of less than one part per billion (ppb) in the soil has been shown to be an acceptable standard for public or residential areas, with a level of 5-7 ppb being the NJDEP and EPA standard for industrial sites." Maxus recommended that the acceptable level of dioxin be set at 5-7 ppb rather than 1 ppb at the Diamond Shamrock site, since the site is industrial.

At the present time, it is impossible to predict with certainty the future land use at the site. Therefore, EPA and NJDEP will require a 1 ppb standard to protect the possibility for all potential land uses.

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B. **In his letter of August 17, 1987, Michael Gordon stated that, "The DEP decision not to require site stabilization (alternative 3) in conjunction with a requirement that an off-site incinerator be sited, designed and constructed pursuant to a detailed time schedule, is arbitrary and unreasonable."**

EPA and NJDEP have not established that excavation can be conducted with acceptable impact on health and the environment. Furthermore, EPA and NJDEP do not know at this time whether off-site incineration will be preferable to on-site incineration or to some other remedy at some point in the future. This will depend on factors such as the future availability of off-site facilities permitted for dioxin, the ability to resolve siting difficulties in the future, the cost differences between on-site and off-site incineration, the performance of the interim remedy (which would dictate the urgency of undertaking additional remedial action), etc. These factors can be better evaluated in the future. Therefore, it is premature to select off-site incineration or any other option as the second phase of a remedy which begins by stabilizing the site by implementing the proposed containment plan.

C. **The mayor of Newark, Mr. Sharpe James, in his letter of August 18, 1987:**

- **stated his belief that NJDEP will soon "fail to meet its own recommended biennial timetable. The Feasibility Study on which the public meeting was based, was dated December, 1985. Almost two years have already lapsed without any of the alternatives being implemented. Therefore, per DEP's commitment, the biennial review process of feasible disposal alternatives should be initiated before December, 1987."**

The biennial timetable as described in the Proposed Plan has not yet begun. It is scheduled to begin two years after the selected remedy has been installed However, as noted in answer to question 7, this Record of Decision is not based solely upon the feasibility study, but also upon additional information, not available at the time the FS was prepared, contained in the Administrative Record.

- **stated that the proposed containment plan cannot be implemented until it meets the siting criteria of the Major Hazardous Waste Facility Siting Act. The plan must be approved by the Siting Commission.**

The Major Hazardous Waste Facility Siting Act applies only to commercial hazardous waste management facilities, and does not apply to the Proposed Plan.

D. In her letter dated July 27, 1987, Ms. Kathleen Craig commented that the proposed containment plan "is only a way of putting off the inevitable." She enclosed some literature concerning a recently developed thermal treatment system (Ogden Environmental Services' circulating bed combustor).

EPA and NJDEP are aware of the Ogden combustor, which has not yet been demonstrated for dioxin wastes. However, its success in treating PCB wastes makes it promising for future use with wastes from the Diamond Shamrock site. Responses to other comments on thermal treatment are also relevant to Ms. Craig's comment.

Although Ms. Craig did not elaborate on what she means by "putting off the inevitable," EPA and NJDEP recognize that the proposed containment remedy requires continued operation and maintenance, and may require additional remedial action should it become less effective with the passage of time. The proposed remedy includes provisions for operation, maintenance, periodic re-evaluation, and additional remedial action, if appropriate. EPA and NJDEP have determined that the proposed containment remedy is currently the most protective of the available remedial alternatives.

E. In his letter dated September 6, 1987, Peter Montague submitted written comments elaborating on the comments which he made at the August 11, 1987, public meeting.

Because his written comments were submitted after the close of the public comment period, a response to Mr. Montague's written comments is not provided in this responsiveness summary. However, Mr. Montague's oral comments have been addressed in a previous section of this document. To address Mr. Montague's written comments in this document would delay the Record of Decision and the initiation of remedial action. EPA and NJDEP have decided that Mr. Montague's written comments do not merit any change in the selected alternative. However, NJDEP intends to send a written response directly to Mr. Montague.

APPENDIX B

Site Evaluation Analytical Results

SITE INVESTIGATION
AMBIENT AIR RESULTS FOR DIOXIN

DATE AND SAMPLE ID	9-10-84 -0144-A-K	9-11-84 -0181-	9-12-84 -0182-	9-17-84 -0414-	9-19-84 -0597-	9-21-84 -0711-	9-24-84 -0714-	9-25-84 -0843-	10-3-84 -1084-	10-4-84 -1241-
PARAMETERS										
Dioxin (pg/m^3)	86	ND(<8)	ND(<6)	ND(<31)	ND(<8)	ND(<4)	286	ND(<10)	ND(<6)	ND(<15)

SITE INVESTIGATION
AMBIENT AIR RESULTS FOR PNA

DATE AND SAMPLE ID	9-10-84 -0144-A-E	9-11-84 -0181-	9-12-84 -0182-	9-17-84 -0414-	9-19-84 -0597-	9-21-84 -0711-	9-24-84 -0714-	9-25-84 -0843-	10-3-84 -1004-	10-4-84 -1241-
PARAMETERS										
PNA: (ug/m^3)										
Benzo(k)fluoranthene	0.51	0.63	1.01	0.80	1.41	0.72	1.24	1.35	0.73	1.35
Benzo(a)pyrene	0.54	0.67	3.01	0.98	2.50	1.66	2.20	1.10	0.76	2.79
Benzo(g,h,i)perylene	0.70	1.08	2.10	1.96	2.35	2.10	1.09	2.55	1.63	1.66
Indeno(1,2,3-c,d)pyrene (Coronene)	0.47	0.33	0.71	1.08	1.97	1.07	0.94	1.56	0.66	3.50
Phenanthrene	0.08	0.38	0.09	0.28	1.07	0.46	0.09	0.72	0.29	0.04
Triphenylene	0.30	0.36	1.50	0.38	0.06	0.31	0.68	0.00	0.29	0.59
Benzo(b)fluoranthene	1.00	0.06	1.62	0.97	1.97	0.91	1.66	1.55	0.52	1.09
Anthracene	0.06	0.05	0.21	0.05	0.17	0.06	0.11	0.09	0.02	0.12
Fluoranthene	1.36	1.10	6.66	1.01	2.69	1.07	2.26	2.01	0.54	2.32
Pyrene	1.19	1.16	1.76	1.13	2.42	1.47	1.86	2.01	0.53	1.34
Benzo(a)anthracene	0.78	0.65	0.56	0.76	1.45	0.59	1.22	1.20	0.37	1.38
Benzo(a,h)anthracene	2.05	2.34	2.9[illegible]	2.79	*	1.27	2.72	2.39	1.04	2.11
Chrysene	0.73	0.63	0.5[illegible]	0.58	1.39	0.53	1.17	1.32	0.33	1.17
Perylene	7.16	5.75	*	6.05	12.02	5.70	11.99	10.40	3.24	15.62

*Results not available as of February 14, 1985.

SITE INVESTIGATION
AMBIENT AIR RESULTS FOR PESTICIDES

DATE AND SAMPLE ID	9-10-84 -0144-A-K	9-11-84 -0181-	9-12-84 -0182-	9-17-84 -0414-	9-19-84 -0597-	9-21-84 -0711-	9-24-84 -0714-	9-25-84 -0843-	10-3-84 -1084-	10-4-84 -1241-
PARAMETERS										
Pesticides: (ng/m^3)										
Benzene sulfonyl chloride	2.97	<2.30	<2.22	<14.39*	<2.55	<14.39*	<7.55*	<2.36	<2.36	<2.44
Tetrachlorobenzene	<0.1	<0.10	<0.10	<35.97*	<0.06	<0.75*	1.76*	<0.10	<0.10	<1.04*
4-chlorobenzene sulfonyl chloride	<13.5	<13.6	<12.7	<14.39	24.20	<14.39	<15.09	18.92	<13.47	<139.3*
4-methanybenzene sulfonyl chloride	43.92	29.93	50.79	<71.9*	47.77	39.57	49.06	50.68	18.52	55.75
Hexachlorobenzene	0.71	0.32	0.79	0.97	0.32	0.47	0.72	<0.07	0.30	1.71
2,4,5-T(methyl ester)	3.38	2.52	2.70	2.19	2.36	1.00	2.60	2.94	1.18	1.71
Ovex	<1.35	<1.36	<1.27	<1.44	<1.27	<1.44	<1.51	<1.35	<1.35	<1.39
p,p'-DDT	4.73	4.08	<3.17	<3.60	<3.18	<3.60	3.77	<3.38	<3.37	<3.48

* - higher detection limit due to sample matrix interference.

NEAR-SURFACE SOIL SAMPLE
2,3,7,8-TCDD RESULTS
(ug/kg or ppb)

		GRID LOCATIONS																				
SAMPLE ELEVATION CODE	DEPTH (inches)	A-2-E	A-6-F	A-9-E	B-3-H	C-8-B	D-6-B	E-1-B	E-5-D	F-3-E	G-3-I	C-7-L	G-6-A	C-5-E	C-5-F	D-1-B	D-7-D	D-2-B	D-5-F	D-7-F	D-7-B	J-6-E
100	0-6	226	0.79	695	107	3.0	3.0	175	[illegible]	[illegible]	[illegible]	110	990	221	351	90.6	91.5	7,900	30.5	9,050	79.5	7.5
101	6-12	230	1.2	433	11.1	87.5	2.1	4.2	16.6	396	96.1	176	3,090	217	696	30.9	67.0	1,230	69.1	7,710	27.0	1.0
102	12-24	216	7.1	7.3	2.8	12.2	1.2	0.6	10.0	19,500	76.0	11.6	1,170	87.6	229	22.2	177	510	305	709	226	0.92
103	24-36	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
104	36-48	A	A	A	A	B	A	A	A	A	B	A	A	A	A	A	A	B	A	A	B	A
105	48-60	A	A	A	A	B	B	B	A	A	B	A	A	A	A	A	A	B	B	A	B	A

A = the sample was archived for possible future analysis.

B = refusal, thus a sample was not recovered.

NEAR-SURFACE SOIL SAMPLE 2,3,7,8-TCDD REANALYSIS SUMMARY

STATION NUMBER	DEPTH (inches)	ELEVATION CODE	INITIAL RESULTS (ppb)	CORRECTIVE ACTION	REANALYSYS RESULTS (ppb)
A-2-C	0-6	100	296	1 gram	326
A-2-C	6-12	101	289	1 gram	330
A-5-C	0-6	100	500	1 gram	695
A-5-C	6-12	101	460	1 gram	453
F-5-E	0-6	100	268	1 gram	470
F-5-E	6-12	101	247	1 gram	394
F-5-E	12-24	102	>19,000	1 gram, dilution 10:1	19,500
G-3-I	0-6	100	1,110	1 gram	1,010
G-3-L	0-6	100	261	1 gram	310
G-4-A	0-6	100	395	1 gram	276
G-4-A	6-12	101	>3,130	1 gram, dilution 3:1	3,690
G-4-A	12-24	102	>1,515	1 gram	1,770
G-5-F	0-6	100	325	1 gram	361
G-5-F	6-12	101	359	1 gram	494
H-2-H	0-6	100	>1,586	1 gram	2,390
H-2-H	6-12	101	1,180	1 gram	1,230
H-2-H	12-24	102	286	1 gram	510
H-5-F	12-24	102	336	1 gram	385
H-7-F	0-6	100	>5,768	1 gram, dilution 5:1	9,050
H-7-F	6-12	101	>1,550	1 gram	2,730
H-7-F	12-24	102	231	1 gram	200

SUMMARY OF DETECTED VOLATILE ORGANICS
NEAR-SURFACE SOILS
(Expressed as µg/kg or ppb)

	0-6 INCHES			12-24 INCHES		
	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED
Benzene	21	1	21	23,000-11	3	21
Chlorobenzene	84,000-39	2	21	170,000-22	6	21
Chloroform	38	1	21	38,000-13	2	21
Ethylbenzene	-	0	21	60,000	1	21
Methylene chloride	1,500-14	21	21	130,000-21	21	21
Tetrachloroethane	860	1	21	36,000-1,300	2	21
Toluene	-	0	21	2,000,000-7	6	21
Trichloroethene	-	0	21	9	1	21
Acetone	5,000-58	13	21	2,000-68	15	21
2-Butanone	1,400-130	2	21	9,200-51	6	21
Carbon disulfide	-	0	21	7	1	21
2-Hexanone	-	0	21	36,000	1'	21
Total xylenes	-	0	21	310,000	1	21

	0-6 INCHES			17-24 INCHES		
	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	NUMBER CONCENTRATION RANGE RESULTS	NUMBER POSITIVE ANALYZED	SAMPLES
Benzo(a)pyrene	4,000-1,000	3	21	44,000-560	5	21
Benzo(b)fluoranthene	7,100-2,100	3	21	71,000-940	5	21
Chrysene	12,000-2,600	2	21	120,000-1,400	6	21
Acenaphthylene	690-210	2	21	860-240	2	21
Anthracene	3,000-310	4	21	1,200-630	3	21
Benzo(g,h,i)perylene	11,000-3,300	3	21	32,000	1	21
Fluorene	320	1	21	300-250	2	21
Phenanthrene	4,100-250	5	21	61,000-440	6	21
Indeno(1,2,3,-CD)-pyrene	2,500-2,200	2	21	21,000-480	2	21
Pyrene	2,200-230	6	21	78,000-280	7	21
Dibenzofuran	-	0	21	450	1	21
2-Methylnaphthalene	220	1	21	21,000	1	21

SUMMARY OF DETECTED HERBICIDES, PESTICIDES, AND PCB's
NEAR-SURFACE SOILS
(Expressed as µg/kg or ppb)

	0-6 INCHES			12-24 INCHES		
	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED
4,4'-DDT	3,500,000-620	19	21	5,090,000-1,400	15	21
4,4'-DDE	93,000-20	14	21	37,000-1,200	8	21
4,4'-DDD	13,000-1,700	3	21	164,000-1,200	5	21
Alpha-Endosulfan	8,900	1	21	1,400	1	21
Dalapon	70,000-190	9	21	29,000-420	9	21
2,4-D	7,600-740	10	21	85,000-190	13	21
2,4,5-T	2,300-190	9	21	86,000-490	10	21

BORING SOIL SAMPLES
2,3,7,8-TCDD RESULTS
(ug/kg or ppb)

SAMPLE ELEVATION CODE	DEPTH (inches)	STATION NUMBERS A-2-E	A-3-C	C-7-C	D-1-F	F-7-B	I-2-L	I-5-A	I-7-E
100	0-6	56.3	19.7	130	61.6	2,560	2,700	523	350
101	6-12	36.0	10.8	784	7.5	109	210	803	3,310
102	12-24	72.5	7.4	247	4.7	607	93.6	830	59.3
109	above silt	0.36 (6.5-8.5')	ND (0.02) (6.5-8.0')	71.8 (6.5-8.0')	0.78 (6.5-8.7')	2.4 (6.5-8')	17.1 (13.5-15.5')	20.9 (13.5-15.2')	5.8 (7-8.5')
201	silt	ND (0.07) (12.7-14.7')	ND (0.3) (11.0-13.0')	2.1 (10.0-12.0')	ND (0.06) (10.7-12.7')	0.49 (10.0-12.0')	2.2 (17.0-19.0')	no sample	7.8 (13.5-15.2')

SUMMARY OF DETECTED VOLATILE ORGANICS IN SOIL BORINGS
(Expressed as ug/kg or ppb)

	0-6 INCHES			12-24 INCHES			ABOVE SILT		
	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED
Benzene	26	1	8	1,700-600	2	8	22,000-5,600	7	8
Chlorobenzene	330	1	8	26,000-49	4	8	100,000-17	5	8
Ethylbenzene	-	0	8	100	1	8	14,000-220	2	8
Methylene chloride	610-30	8	8	1,600-6	8	8	11,000-40	8	8
Tetrachloroethene	-	0	8	15	1	8	-	0	8
Toluene	12-7	2	8	2,600-9	4	8	100,000-11	2	8
Acetone	160-57	5	8	2,300-110	7	8	4,300-85	6	8
2-Butanone	-	0	8	8,900	1	8	20,000-6,900	2	8
Carbon disulfide	-	0	8	7	1	8	13	1	8
Total xylenes	-	0	8	500	1	8	1,200	1	8

SUMMARY OF DETECTED HERBICIDES, PESTICIDES, AND PCB's
IN SOIL BORINGS
(Expressed as ug/kg or ppb)

	0-6 INCHES			12-24 INCHES			ABOVE SILT		
	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED
4,4'-DDT	830,000-17,000	5	8	3,200,000-43,000	5	8	140,000-100	4	8
4,4'-DDE	57,900-6,500	6	8	297,000-2,400	6	8	1,500-290	4	8
4,4'-DDD	70,000-2,000	5	8	182,000-3,900	5	8	370,000-42	5	8
Beta-BHC	130,000-830	2	8	120,000	1	8	180,000	1	8
Dalapon	21,000-160	6	8	94,000-300	5	8	-	0	8
Dicamba	1,700-230	3	8	1,600-100	3	8	160	1	8
2,4-D	120,000-240	8	8	35,000-110	8	8	2,000,000-140	7	8
2,4,5-T	54,000-96	8	8	14,000-95	7	8	690,000-610	5	8
2,4-DB	-	0	8	1,400	1	8	170	1	8
Dinoseb (DNBP)	590-210	2	8	-	0	8	-	0	8

SUMMARY OF DETECTED BASE/NEUTRAL/ACID ORGANIC COMPOUNDS
NEAR-SURFACE SOILS
(Expressed as µg/kg or ppb)

	0-6 INCHES			12-24 INCHES		
	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED
2,4,6-Trichlorophenol	1,300,000-1,300	5	21	1,700,000-8,700	4	21
2,4-Dichlorophenol	3,600,000-980	7	21	2,500,000-870	8	21
2,4-Dimethylphenol	-	0	21	1,700,000	1	21
Benzoic Acid	1,800	1	21	-	0	21
2,4,5-Trichlorophenol	15,000,000-870	5	21	7,500,000-2,500	5	21
Acenaphthene	250	1	21	-	0	21
1,2,4-Trichlorobenzene	17,000-1,500	2	21	19,000	1	21
Hexachlorobenzene	110,000-560	13	21	720,000-3,200	9	21
1,2-Dichlorobenzene	520-230	2	21	9,000	1	21
1,3-Dichlorobenzene	-	0	21	610	1	21
1,4-Dichlorobenzene	1,400-470	3	21	1,300	1	21
Fluoranthene	6,100-330	5	21	64,000-670	6	21
Naphthalene	200	1	21	8,200	1	21
Bis(2-ethylhexyl)phthalate	1,300-310	3	21	310,000-5,100	3	21
Di-N-butylphthalate	-	0	21	370,000-2,000	7	21
Benzo(a)anthracene	47,000-910	3	21	47,000-510	5	21

SUMMARY OF DETECTED INORGANIC PARAMETERS IN SOIL BORINGS
(Expressed as mg/kg or ppm)

	0-6 INCHES			12-24 INCHES			ABOVE SILT		
	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED
Antimony	11-0.2	8	8	3.5-0.1	8	8	1.1-0.1	6	8
Arsenic	20-1.0	8	8	26-2.1	8	8	120-5.7	8	8
Beryllium	-	0	8	3.7-0.2	5	8	1.4-0.1	5	8
Cadmium	3-0.5	8	8	2.5-0.3	8	8	3-0.1	6	8
Chromium	72-7.9	8	8	40-13	8	8	25-5.5	8	8
Copper	290-46	8	8	730-82	8	8	6,600-24	8	8
Lead	1,600-73	8	8	2,300-100	8	8	11,000-19	8	8
Mercury	11-0.1	8	8	7.6-0.5	8	8	95-0.2	7	8
Nickel	95-15	8	8	170-13	8	8	72-5.0	8	8
Silver	0.97-0.2	6	8	0.9-0.3	6	8	1.8-0.4	5	8
Zinc	3,900-100	8	8	1,500-190	8	8	1,300-45	8	8
Total Cyanides	1.2-0.25	8	8	3.7-0.15	8	8	1.2-0.1	8	8
Total Phenols	13-0.2	8	8	12-0.2	8	8	1,600-0.3	7	8

SUMMARY OF DETECTED BASE/NEUTRAL/ACID ORGANICS
IN SOIL BORINGS
(Expressed as ug/kg or ppb)

	0-6 INCHES			12-24 INCHES			ABOVE SILT		
	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED
2,4,6-Trichlorophenol	37,000-1,300	3	8	4,400-3,600	2	8	360,000-2,000	3	8
2,-Chlorophenol	2,000-230	2	8	870	1	8	6,000-1,200	2	8
2,4-Dichlorophenol	90,000-5,900	3	8	27,000-4,700	3	8	1,400,000-1,700	5	8
Phenol	3,100	1	8	17,000-1,400	2	8	13,000-870	2	8
2,4,5-Trichlorophenol	20,000-1,500	4	8	16,000-1,600	3	8	270,000-12,000	4	8
Acenaphthene	2,700	1	8	4,600	1	8	0	0	8
1,2,4-Trichlorobenzene	1,100-430	2	8	8,500-500	2	8	14,000	1	8
Hexachlorobenzene	35,000-6,300	5	8	84,000-4,900	4	8	30,000	1	8
2-Chloronaphthalene	1,100	1	8	850	1	8	-	-	8
1,2-Dichlorobenzene	770	1	8	8,600-570	2	8	13,000	1	8
1,3-Dichlorobenzene	-	0	8	780	1	8	3,400	1	8
1,4-Dichlorobenzene	2,700	1	8	49,000-960	3	8	20,000-4,600	2	8
Fluoranthene	8,700-400	5	8	20,000-3,290	4	8	1,300-360	3	8
Naphthalene	1,300	1	8	11,000	1	8	16,000-260	5	8
Bis(2-ethylhexyl)phthalate	14,000	1	8	5,100-7,600	2	8	-	0	8

(Continued)

	0-6 INCHES			12-24 INCHES			ABOVE SILT		
	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED
Benzo(a)anthracene	-	0	8	1,900	1	8	-	0	8
Benzo(a)pyrene	-	0	8	1,600	1	8	-	0	8
Benzo(b)fluoranthene	-	0	8	7,400	1	8	1,900	1	8
Chrysene	-	0	8	4,200	1	8	-	0	8
Anthracene	950	1	8	1,200	1	8	-	0	8
Fluorene	2,100	1	8	4,200	1	8	-	0	8
Phenanthrene	3,000-230	3	8	14,000-720	5	8	2,200-350	2	8
Indeno(1,2,3,-CD)-pyrene	-	0	8	1,400	1	8	-	0	8
Pyrene	8,100-270	5	8	10,000-1,100	5	8	460-420	2	8
Benzyl Alcohol	-	0	8	20,000	1	8	41,000	1	8
Dibenzofuran	1,300	1	8	2,100	1	8	-	0	8
2-Methylnaphthalene	2,600	1	8	8,000-850	3	8	14,000-1,600	4	8

SUMMARY OF 2,3,7,8-TDDD
FOR GROUND WATER

WELL NUMBER	LOCATION	SAMPLING DATE	RESULTS (ppb)	SAMPLING DATE	RESULTS (ppb)	SAMPLING DATE	RESULTS (ppb)
1	I-2-L	10-09-84	0.68	10-30-84	0.56		
2	I-5-A	10-09-84	7.9	10-30-84	4.3	12-14-84	10.4
3	I-7-K	10-10-84	0.049	10-30-84	0.03		
4	C-7-C	10-09-84	0.20	10-30-84	0.74		
5	A-2-K	10-09-84	ND(0.008)	10-30-84	0.0059		
6	A-3-C	10-09-84	0.012	10-30-84	0.0086		
7	D-1-F	10-09-84	0.016	10-30-84	ND(0.024)		
8	F-7-B	10-09-84	0.72	10-30-84	1.1		

ND - not detected at the indicated ( ) detection limit.

SUMMARY OF DETECTED INORGANIC PARAMETERS
WELL WATER SAMPLES
(Expressed as µg/l or ppb)

	10-09-84			10-30-84		
	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED
Antimony	0.003-0.151	7	8	0.001-0.024	8	8
Arsenic	0.015-0.621	8	8	0.028-0.629	8	8
Beryllium	0.003-0.008	5	8	0.002-0.010	7	8
Cadmium	0.002-0.029	8	8	0.002-0.023	8	8
Chromium	C.02-0.73	8	8	0.08-1.1	8	8
Copper	0.091-1.3	8	8	0.206-2.9	8	8
Lead	0.18-47	8	8	0.44-14	8	8
Mercury	0.001-0.16	8	8	0.002-0.066	8	8
Nickel	0.06-0.30	8	8	0.06-0.42	8	8
Selenium	ND	0	8	0.007	1	8
Silver	0.003-0.007	4	8	0.002-0.015	5	8
Zinc	0.247-17	8	8	0.864-17	8	8
Total Cyanide	0.01-0.35	7	8	0.01-0.63	7	8
Total Phenol	0.03-102	8	8	0.03-78	8	8

SUMMARY OF DETECTED HERBICIDES, PESTICIDES, AND PCB's
WELL WATER SAMPLES
(Expressed as ug/l or ppb)

	10-09-84			10-30-84		
	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED
4,4'-DDT	17-22,000	4	8	14-2,770	4	8
4,4'-DDE	17-54	2	8	7-14	2	8
4,4'-DDD	15-13,000	5	8	7-1,390	4	8
Alpha-endosulfan	ND	0	8	1,240	1	8
2,4-D	6.9-27,000	6	8	74-20,000	4	8
2,4,5-T	470-3,600	4	8	68-3,500	4	8
2,4-DB	500	1	8	ND	0	8
Dinoseb (DNBP)	4.2	1	8	ND	0	8

SUMMARY OF DETECTED VOLATILE ORGANICS
WELL WATER SAMPLES
(Expressed as µg/l or ppb)

	10-09-84			10-30-84		
	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED
Benzene	3.0-3,900	8	8	10-7,900	7	8
Chlorobenzene	14-8,500	6	8	4-23,000	7	8
1,2-Dichloroethane	1,700	1	8	2,000	1	8
1,1,1-Trichloroethane	410	1	8	1,500	1	8
1,1-Dichloroethane	5	1	8	190	1	8
Chloroform	20-230	2	8	19-240	3	8
1,1-Dichloroethane	ND	0	8	53	1	8
trans-1,2-Dichloroethene	33-360	2	8	30-1,300	2	8
Ethylbenzene	44-740	3	8	43	2	8
Methylene chloride	6-12,000	8	8	3-7,400	8	8
Tetrachloroethene	2-5	2	8	2-43	3	8
Toluene	7-1,100	6	8	55-3,300	5	8
Trichloroethene	15-230	2	8	9-280	2	8
Vinyl chloride	28-88	2	8	24-220	2	8
Acetone	29-540	3	8	21-520	3	8
2-Butanone	870	1	8	180-430	2	8
Carbon disulfide	2-65	2	8	ND	0	8
4-Methyl-2-pentanone	3,300	1	8	1,800	1	8
Total xylenes	42-960	4	8	13-570	4	8

SUMMARY OF DETECTED BASE/NEUTRAL/ACID ORGANICS
WELL WATER SAMPLES
(Expressed as µg/l or ppb)

	10-09-84			10-30-84		
	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED
2,4,6-Trichlorophenol	1,700-11,000	3	8	290-3,900	3	8
2-Chlorophenol	290-4,600	3	8	11-3,600	4	8
2,4-Dichlorophenol	160-48,000	5	8	370-58,000	4	8
Phenol	36-3,700	5	8	43-600	3	8
Benzoic Acid	250	1	8	ND	0	8
2-Methylphenol	ND	0	8	24	1	8
4-Methylphenol	39-66	2	8	ND	0	8
2,4,5-Trichlorophenol	56-8,800	5	8	38-26,000	4	8
Acenaphthene	ND	0	8	30	1	8
1,2,4-Trichlorobenzene	200	1	8	9-890	3	8
Hexachlorobenzene	ND	0	8	770-860	2	8
2-Chloronaphthalene	ND	0	8	5	1	8
1,2-Dichlorobenzene	11-390	3	8	3-980	4	8
1,3-Dichlorobenzene	ND	0	8	13-200	2	8
1,4-Dichlorobenzene	110-590	3	8	6-1,200	4	8
Fluoranthene	15	1	8	3-120	5	8
Naphthalene	10-320	4	8	11-480	3	8
Bis(2-ethylhexyl)phthalate	55	1	8	3-75	3	8
Di-N-butylphthalate	12	1	8	8	1	8
Benzo(a)anthracene	ND	0	8	8	1	8
Anthracene	ND	0	8	4	1	8
Fluorene	10	1	8	32	1	8
Phenanthrene	2-34	2	8	3-110	5	8
Pyrene	3-19	3	8	5-46	5	8
Benzyl alcohol	8,000	1	8	4,300	1	8
2-Methylnaphthalene	7-260	4	8	3-900	6	8

SUMMARY OF RECENT DIOXIN CONCENTRATIONS IN GROUND WATER IN GLACIOFLUVIAL SANDS

WELL NUMBER	SAMPLING DATE	RESULTS (ppb)
MW-2B	06/17/85	4.2×10^{-3}
MW-7B	06/17/85	3.4×10^{-3}
MW-10D	06/05/85	ND ($<1 \times 10^{-3}$ ppb)(a)

(a)Value reported in parenthesis is the detection limit of a sample reporting nondetectable.

GROUND WATER ORGANIC PRIORITY POLLUTANT
ANALYTICAL RESULTS
(µg/ℓ)

COMPOUND	MONITORING WELLS AND SAMPLING DATES						
	MW-2B	MW-7B	MW-10A	MW-10A	MW-10B	MW-10B	MW-10D
	06/17/85	06/17/85	12/14/84	01/08/85	12/14/84	01/08/85	06/25/85
Benzene	1,200	24	200	160	610	360	ND(a)
Chlorobenzene	9,100	720	1,600	570	8,500	5,300	4
Methylene Chloride	280	120	640	170	4,100	2,800	40
Toluene	850	ND	ND	ND	ND	ND	1
Acetone	ND	ND	550.0	ND	ND	ND	ND
2,4,6-Trichlorophenol	1,500	ND	ND	ND	ND	ND	ND
2-Chlorophenol	160	ND	ND	ND	ND	12	ND
2,4-Dichlorophenol	7,200	ND	ND	ND	ND	ND	ND
Phenol	290	ND	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	1,500	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	ND	ND	ND	ND	ND	12	ND
1,2-Dichlorobenzene	ND	5	260	ND	1,300	240	ND
1,3-Dichlorobenzene	ND	ND	ND	ND	ND	64	ND
1,4-Dichlorobenzene	200	22	810	ND	4,700	1,300	ND
Bis(2-ethylhexyl)phthalate	ND	8	ND	ND	ND	3	ND
Di-N-Octylphthalate	ND	25	ND	ND	ND	ND	ND
Aniline	ND	ND	9,300	18,000	70	ND	ND
2-Methylnaphthalene	ND	2	ND	ND	ND	ND	ND

See footnote at end of table.

	MONITORING WELLS AND SAMPLING DATES						
COMPOUND	MW-2B	MW-7B	MW-10A	MW-10A	MW-10B	MW-10B	MW-10D
	06/17/85	06/17/85	12/14/84	01/08/85	12/14/84	01/08/85	06/25/85
4,4'-DDT	ND	ND	ND	ND	17.0	ND	ND
4,4'-DDE	0.15	ND	ND	ND	ND	ND	ND
4,4'-DDD	0.32	12.0	ND	ND	1.5	ND	ND
Alpha-BHC	ND	ND	ND	ND	7.3	ND	ND
Beta-BHC	ND	ND	ND	ND	1.9	ND	ND
Delta-BHC	ND	3.6	ND	ND	4.8	ND	ND
Dalapon	ND	ND	ND	2.0	ND	2.0	8.0
Dicamba	ND	ND	1.0	ND	ND	1.0	1.0
MCPP	ND	ND	ND	ND	ND	1,000	ND
MCPA	ND	ND	ND	ND	ND	1,000	ND
Dichloroprop	ND	ND	ND	2.0	ND	ND	ND
2,4-D	613.0	2.0	ND	2.0	ND	3.2	2.0
2,4,5-T	123.0	1.76	ND	ND	ND	2.0	ND
2,4-DB	ND	ND	ND	ND	ND	4.0	ND

(a)ND - Not detected.

GROUND WATER INORGANIC PRIORITY POLLUTANT
ANALYTICAL RESULTS
(ppm)

PARAMETER	MONITORING WELLS AND SAMPLING DATES											
	MW-2B	MW-2B	MW-2C	MW-4B	MW-4C	MW-7B	MW-7B	MW-10A	MW-10A	MW-10D	MW-11D	MW-11D
	06/17/85	06/25/85	06/25/85	06/25/85	06/25/85	06/17/85	06/25/85	12/14/84	01/08/85	06/25/85	12/14/84	01/08/85
Antimony	<0.001	0.003	0.003	<0.001	<0.001	0.001	<0.001	<0.002	0.005	0.007	0.001	0.002
Arsenic	0.011	0.011	0.026	0.022	0.047	0.063	0.041	0.010	0.015	0.006	0.011	0.044
Beryllium	<0.002	0.003	0.005	0.002	0.005	0.003	<0.002	<0.002	0.003	<0.002	<0.002	0.006
Cadmium	<0.001	<0.001	<0.001	<0.001	<0.001	0.004	<0.001	<0.001	<0.001	<0.001	<0.003	0.014
Chromium	0.12	0.04	0.03	0.05	0.16	0.19	0.03	0.04	0.08	0.10	0.03	0.23
Copper	0.020	0.013	0.025	0.050	0.168	0.294	0.020	0.052	0.130	0.112	0.050	0.251
Lead	0.04	<0.01	<0.01	<0.01	0.04	0.08	<0.01	0.76	1.2	0.07	0.02	0.11
Mercury	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.004	0.004	<0.001	<0.001	<0.001
Nickel	0.06	0.03	<0.01	0.03	0.12	0.15	<0.01	0.02	0.05	0.05	0.03	0.16
Selenium	0.006	<0.004	<0.008	<0.004	<0.01	0.005	<0.004	<0.03	0.007	<0.008	<0.006	<0.004
Silver	<0.002	0.026	0.021	0.099	<0.002	<0.002	<0.002	0.003	<0.002	0.003	<0.002	<0.002
Thallium	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Zinc	0.045	0.042	0.045	0.079	0.378	0.632	0.040	1.7	1.5	0.156	0.090	2.7
Total Cyanide	NA(a)	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01
Total Phenols	NA	11.4	2.3	0.6	0.06	0.02	0.02	0.12	0.17	0.01	0.05	0.10

(a)NA - Not analyzed.

SUMMARY OF DETECTED INORGANIC PARAMETERS
NEAR-SURFACE SOILS
FROM SITE AND NEWARK BACKGROUND SAMPLES

(Expressed as ug/kg or ppb)

	SITE - 0-6 INCHES			SITE - 12-24 INCHES			NEWARK BACKGROUND - 0-6 INCHES		
	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED
Antimony	6.6-0.09	14	21	3.0-0.10	17	21	9.1-2.2	3	3
Arsenic	23-0.13	21	21	61-0.60	21	21	10-4.6	3	3
Beryllium	0.03-0.22	11	21	0.04-0.25	9	21	0.5-0.47	2	3
Cadmium	3.9-0.09	17	21	26-0.08	14	21	2.0-2.0	3	3
Chromium	50-1.1	21	21	50-3.9	21	21	90-51	3	3
Copper	260-2.4	21	21	250-2.0	20	21	111-127	3	3
Lead	887-1.0	21	21	644-2.1	20	21	1,700-595	3	3
Mercury	39-0.1	10	21	37-0.4	16	21	2.0-0.6	3	3
Nickel	82-3.1	20	21	40-2.1	20	21	26-35	3	3
Selenium	0.48	1	21	2.2-0.01	3	21	-	0	3
Silver	1.2-0.24	7	21	11-0.25	6	21	1.6-0.65	3	3
Zinc	29,000-20	21	21	1,300-0.0	21	21	820-420	3	3
Total Cyanide	1.97-0.15	19	21	2.0-0.10	19	21	2.9-0.70	3	3
Total Phenols	47.0-0.20	20	21	3,370-0.10	21	21	117	1	1

SUMMARY OF DETECTED HERBICIDES, PESTICIDES AND PCBs
NEAR-SURFACE SOILS
FROM SITE AND NEWARK BACKGROUND SAMPLES

(Expressed as ug/kg or ppb)

	SITE - 0-6 INCHES			SITE - 12-24 INCHES			NEWARK BACKGROUND - 0-6 INCHES		
	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED
4,4'-DDT	3,500,000-620	19	21	5,090,000-1,400	15	21	200	1	3
4,4'-DDE	93,000-20	9	21	37,000-1,200	8	21	77-32	2	3
4,4'-DDD	13,000-1,700	3	21	164,000-1,200	5	21	-	0	3
Alpha-Endosulfan	8,900	1	21	1,400	1	21	-	0	3
PCB-1260	-	0	21	-	0	21	1,700-1,200	2	3
Dalapon	70,000-190	9	21	29,000-420	9	21	-	0	3
2,4-D	7,600-740	10	21	85,000-190	13	21	-	0	3
2,4,5-T	2,300-190	9	21	86,000-490	10	21	-	0	3

SUMMARY OF DETECTED VOLATILE ORGANICS
NEAR-SURFACE SOILS
FROM SITE AND NEWARK BACKGROUND SAMPLES

(Expressed as ug/kg or ppb)

	SITE - 0-6 INCHES			SITE - 12-24 INCHES			NEWARK BACKGROUND - 0-6 INCHES		
	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED
Benzene	21	1	21	23,000-11	3	21	-	0	3
Chlorobenzene	84,000-79	2	21	170,000-22	6	21	-	0	3
Chloroform	38	1	21	30,000-13	7	21	-	0	3
Ethylbenzene	-	0	21	60,000	1	21	-	0	3
Methylene chloride	1,500-16	21	21	130,000-21	21	21	66-32	3	3
Tetrachloroethene	860	1	21	56,000-1,300	2	21	-	0	3
Toluene	-	0	21	2,000,000-7	6	21	-	0	3
Trichloroethene	-	0	21	9	1	21	-	0	3
Acetone	5,000-50	13	21	2,000-68	15	21	-	0	3
2-Butanone	1,400-130	2	21	9,200-51	6	21	-	0	3
Carbon disulfide	-	0	21	7	1	21	-	0	3
2-Hexanone	-	0	21	36,000	1	21	-	0	3
Total xylenes	-	0	21	310,000	1	21	-	0	3

SUMMARY OF DETECTED BASE/NEUTRAL/ACID ORGANIC COMPOUNDS
NEAR-SURFACE SOILS
FROM SITE AND NEWARK BACKGROUND SAMPLES
(Expressed as ug/kg or ppb)

	SITE - 0-6 INCHES			SITE - 12-24 INCHES			NEWARK BACKGROUND - 0-6 INCHES		
	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED
2,4,6-Trichlorophenol	1,500,000-1,300	5	21	1,700,000-8,700	4	21	-	0	3
2,4-Dichlorophenol	3,600,000-900	7	21	2,500,000-870	8	21	-	0	3
2,4-Dimethylphenol	-	0	21	1,700,000	1	21	-	0	3
Benzoic Acid	1,000	1	21	-	0	21	-	0	3
2,4,5-Trichlorophenol	15,000,000-870	5	21	7,500,000-2,500	5	21	-	0	3
Acenaphthene	250	1	21	-	0	21	-	0	3
1,2,4-Trichlorobenzene	17,000-1,500	2	21	19,000	1	21	-	0	3
Hexachlorobenzene	110,000-560	13	21	720,000-3,200	9	21	620,000-110,000	2	3
1,2-Dichlorobenzene	570-230	2	21	9,000	1	21	-	0	3
1,3-Dichlorobenzene	-	0	21	610	1	21	-	0	3
1,4-Dichlorobenzene	1,400-470	3	21	1,300	1	21	-	0	3
Fluoranthene	6,100-330	5	21	64,000-670	6	21	3,500-2,600	3	3
Naphthalene	200	1	21	8,200	1	21	400	1	3
Bis(2-ethylhexyl)phthalate	1,300-310	3	21	310,000-5,100	3	21	1,700-670	3	3

	BO LISTER - 0-6 INCHES			BO LISTER - 12-24 INCHES			DEMARK BACKGROUND - 0-6 INCHES		
	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED	CONCENTRATION RANGE	NUMBER POSITIVE RESULTS	NUMBER SAMPLES ANALYZED
Di-N-butylphthalate	-	0	21	370,000-2,000	2	21	200	1	3
Benzo(a)anthracene	47,000-910	3	21	47,000-510	5	21	1,900-1,500	3	3
Benzo(a)pyrene	4,000-1,000	3	21	44,000-360	5	21	1,500-1,200	3	3
Benzo(b)fluoranthene	7,100-2,100	3	21	71,000-940	5	21	2,700-2,200	3	3
Chrysene	12,000-2,600	2	21	120,000-1,400	6	21	3,700-3,200	3	3
Acenaphthylene	690-210	2	21	860-740	2	21	610-250	3	3
Anthracene	3,000-310	4	21	1,200-630	3	21	600-500	2	3
Benzo(g,h,i)perylene	11,000-3,300	3	21	32,000	1	21	2,300-1,500	3	3
Fluorene	320	1	21	300-250	2	21	2,000-1,300	3	3
Phenanthrene	4,100-250	5	21	61,000-440	6	21	-	0	3
Indeno(1,2,3,-cd)-pyrene	2,300-2,200	2	21	21,000-480	2	21	1,700-1,100	3	3
Pyrene	2,200-230	6	21	78,000-200	7	21	1,700-1,400	3	3
Dibenzofuran	-	0	21	450	1	21	-	0	3
2-Methylnaphthalene	220	1	21	21,000	1	21	-	0	3

SEWERS AND SUMPS
2,3,7,8-TCDD RESULTS SUMMARY

ANALYSIS LOCATION	NUMBER OF SAMPLES	NUMBER OF POSITIVE RESULTS	RANGE OF CONCENTRATION (ppb)
Sewers	4	4	195-4,040
Sumps			
Manufacturing Building	5	5	105-2,950
Process Building	3	3	350-9,160
TOTAL	12	12	19.5-9,160

SUMMARY OF 2,3,7,8-TCDD RESULTS
BUILDINGS AND STRUCTURES

LOCATION	WIPES			CHIPS			BULK		
	NUMBER OF SAMPLES	NUMBER OF POSITIVE ANALYSES	RANGE OF CONCENTRATION (ng/m²)	NUMBER OF SAMPLES	NUMBER OF POSITIVE ANALYSES	RANGE OF CONCENTRATION (ppb)	NUMBER OF SAMPLES	NUMBER OF POSITIVE ANALYSES	RANGE OF CONCENTRATION (ppb)
Office and Laboratory	24[1]	22	10-14,000	16	10	0.57-69.3	-	-	-
Warehouse	8	8	13-19,000	16	13	1.0-192	-	-	-
Manufacturing Building	5	4	233-7,000	23	23	0.93-1,200	-	-	-
Process Building	14	14	6.4-41,600	10	10	2.7-1,500	5	5	3.0-120
Other Structures	-	-	-	6	6	1.2-50.0	1	1	0.17
TOTAL	51	48	6.4-41,600	71	62	0.57-1,500	6	6	0.17-120

[1] One sample void